

Section 4 – Environmental Impacts

In accordance with NEPA regulations codified in 40 CFR 1502.16, this section forms the scientific and analytic basis for comparisons among the alternatives. The discussions in this section disclose both adverse and beneficial impacts to the resources described in Section 3 that are most likely to occur for each alternative. Impacts to each resource are discussed and measures to mitigate impacts, where possible, are identified at the end of each subsection.

According to the Council on Environmental Quality, direct effects are caused by the action, and occur at the same time and place. Direct impacts are discussed in each resource area subsection. Indirect effects are caused by the action and occur later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects are generally not quantifiable, but can be reasonably predicted to occur. Where significant indirect impacts are identified, they are also discussed under the resource area subsection. Cumulative impacts are the impacts to the environment which result from the incremental impact of the action when added to other past, present, and reasonable foreseeable future actions. Cumulative impacts are addressed in Section 4.19.

4.1 Direct and Indirect Land Use Impacts

Land use impacts include property acquisition and the subsequent conversion of various land use types to transportation use. Land use impacts also include induced development. Expected areas of induced commercial growth, by Build Alternative, are shown on Figure 4-1. As shown previously on Figure 3-1c in Section 3, many of the indirect growth expected from the Build Alternatives is in areas already planned for future development by the study area cities. The differences would be in the type of development expected (residential versus commercial), and the timing of that development (accelerated under any of the Build Alternatives).

The environmental impacts associated with both the direct and indirect changes in land use are discussed further in the applicable resource sections later in this chapter.

Commercial and Residential Properties

Property acquisitions consist of either linear “strip takes,” or takes of entire parcels. Table 4-1 depicts the acreage by either residential or commercial land use that would be converted to transportation land use.

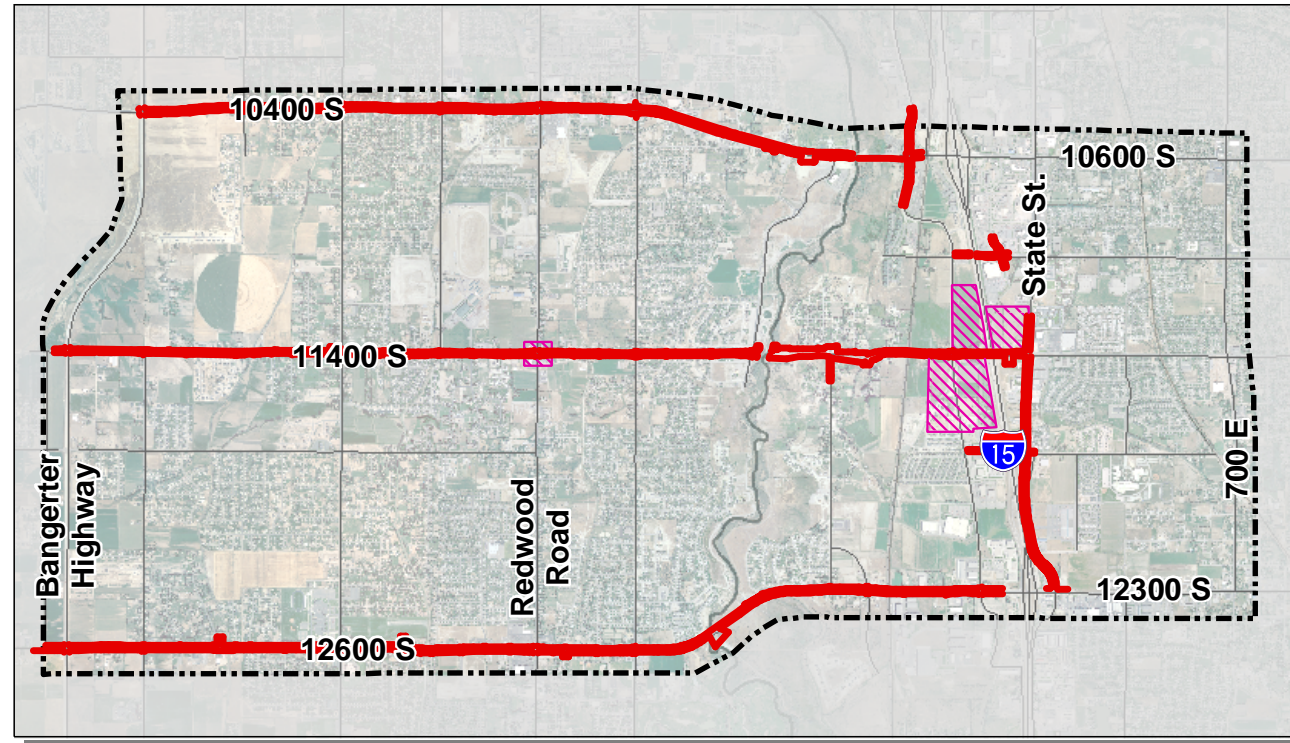
Table 4-1.
Acreage of Land Use Changes to Transportation Use
by Alternative

Roadway	Alternative 1		Alternative 3A		Alternative 4		Alternative 7	
	Res	Comm	Res	Comm	Res	Comm	Res	Comm
10600 South	5.7	4.5	5.7	4.5	0	1.4	2.4	3.9
11400 South	22.6	2.1	N/A	N/A	22.6	15.2	22.6	2.1
12600 South	8.5	3.4	8.5	3.4	N/A	N/A	N/A	N/A
Jordan Gateway/ Lone Peak Parkway	N/A	N/A	4.7	10.2	N/A	N/A	4.7	10.2
State Street	1.9	2.4	N/A	N/A	N/A	N/A	N/A	N/A
11800/ 11000 South	N/A	3.0	N/A	3.0	N/A	N/A	N/A	N/A
Total Acres	38.7	15.4	18.9	21.1	22.6	16.6	29.7	16.2
Total number of Properties Affected	437	182	300	162	151	28	216	95
Total acreage by Alternative	54.1		40.0		39.2		45.9	

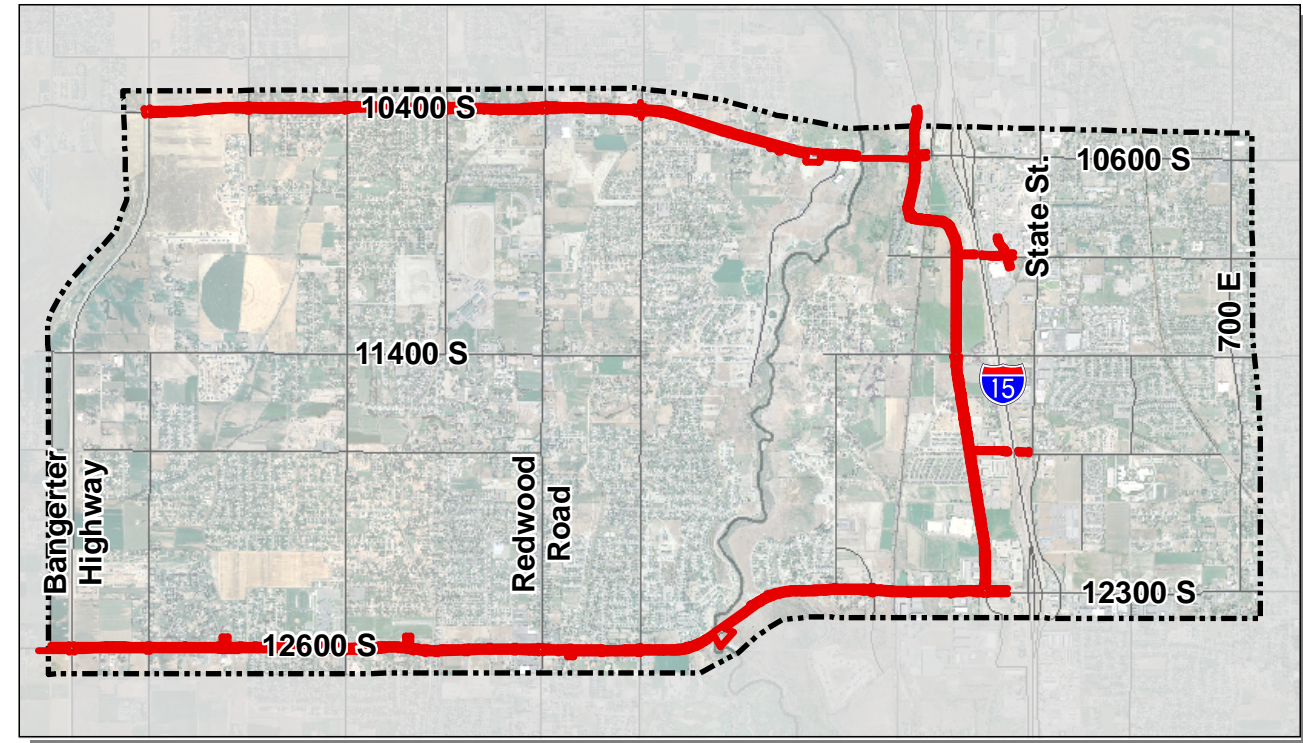
Res = residential; Comm = commercial; N/A = not applicable



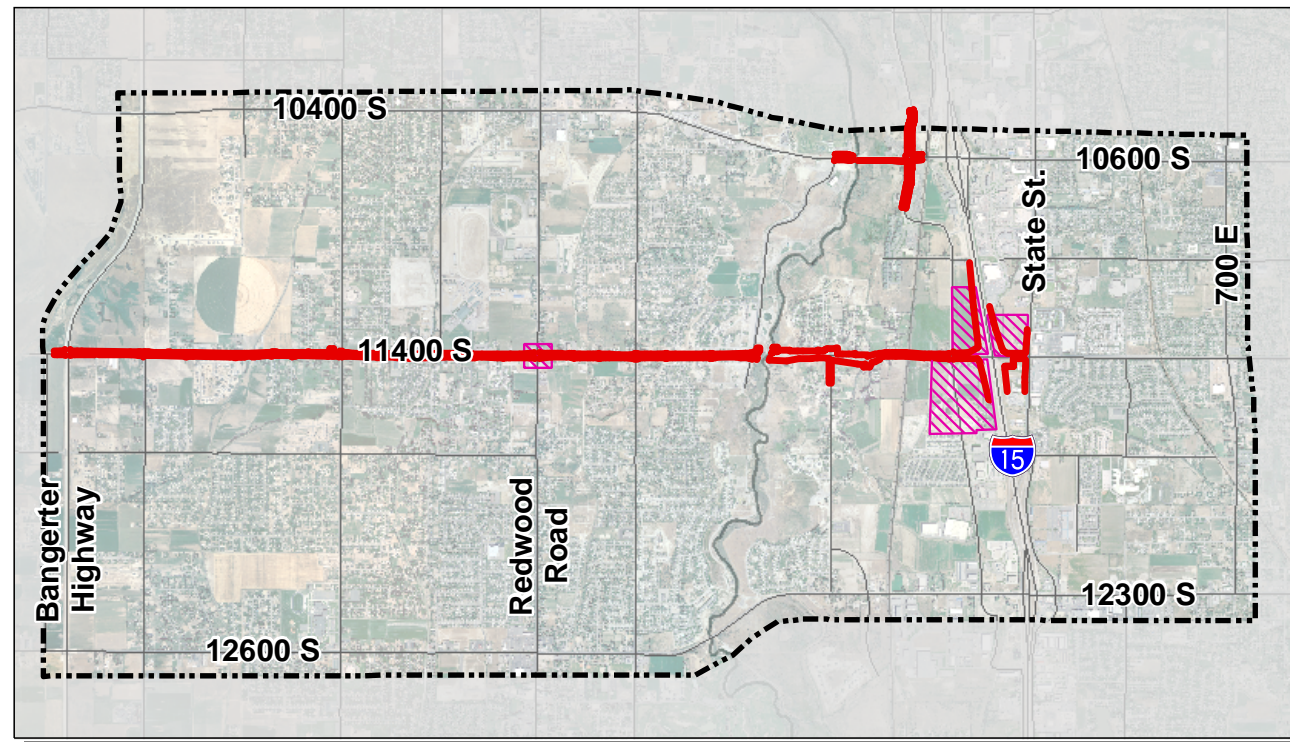
ALTERNATIVE 1



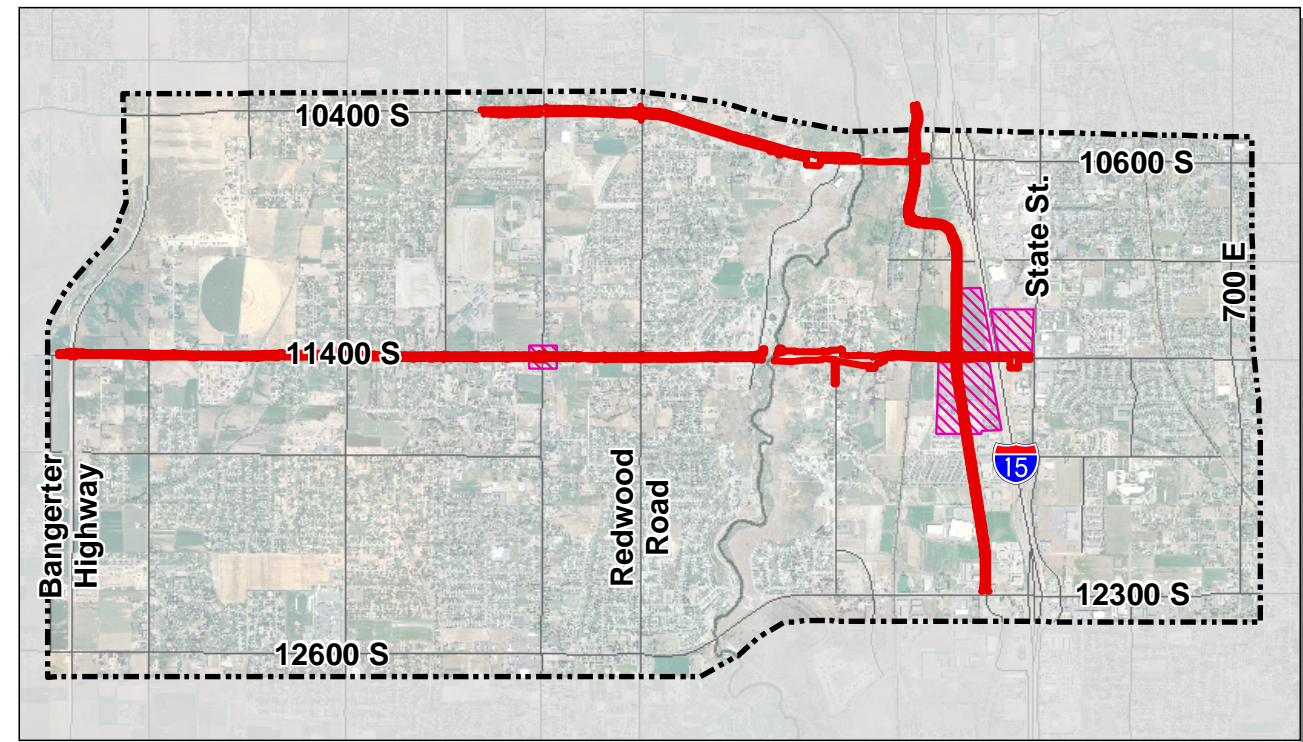
ALTERNATIVE 3A



ALTERNATIVE 4



ALTERNATIVE 7





-  Expected Indirect Commercial Development
-  Alternative Right-of-Way Line

Figure 4-1.
Indirect Commercial Development
by Alternative

Table 4-1 includes land use changes due to strip take properties and land use changes due to relocation properties (the portion of the relocation property that is converted to transportation use). For this table, residential land use consists of areas on which people reside; commercial land use consists of any business-related land use, such as office space, industrial, and retail uses, among others. The number of properties affected by the strip takes is also included in Table 4-1. Residential and commercial relocations are detailed in Section 4.3.2.

The land remaining of an acquired parcel would be available for future development after the transportation project is complete. The previous property owner would have the first right to purchase back the unneeded property unless they choose to waive that right. In addition, UDOT would assure appropriate temporary and permanent access is provided to properties along any roadway affected by their construction activities.

Farmlands and Open Space

The Utah Division of Parks and Recreation has the authority to regulate and control development in the Jordan River flood plain. Through a cooperative effort with the Division and the local municipalities, a nearly continuous corridor on each side of the Jordan River has been preserved as open space. This corridor typically extends 150 feet on each side of the river. When State ownership extends beyond 150 feet from the River, the Division's authorities also extend to those lands. More information on the Jordan River Parkway jurisdiction is found in *Section 5.3.1.1 Jordan River Parkway and Trail*.

The proposed Jordan River crossing at 11400 South and bridge widening at 10600 South and 12300 South would encroach upon the Jordan River Parkway and the 100- and 500-year floodplains. The Parkway open space is managed by the State Division of Parks and Recreation for multiple use, including recreation and utility corridors/easements. The widened and/or new roadway

bridges would not be expected to change the uses of this open space. All utility easements would remain and more access to recreational facilities would be available. Impacts associated with the Parkway and floodplains for each Build Alternative are discussed further in Sections 4.5 and 4.8, respectively

There are areas within the study area zoned as agricultural (see Figure 3-1). However, development has been planned in most of these areas by both South Jordan City and Draper City. The Build Alternatives may cause the conversion of these agricultural areas to residential and retail development at a faster rate than the No Build Alternative.

Consistency with Land Use Plans

Land use plans for each of the four cities in the study area were considered in developing both the project purpose and need and the range of feasible alternatives, thus ensuring consistency between roadway improvements and land use planning efforts. It is expected that future development would occur according to the cities' land use plans. Recent and planned development activities within and adjacent to the study area are detailed in Section 4.19, *Cumulative Impacts*.

No Build Alternative

The No Build Alternative would not require any property acquisitions. This alternative would not change any current land uses to transportation uses. Residential and commercial development in each of the study area cities would be expected to occur as presented in Section 1.4.3, *Economic Development*. However, as discussed in Section 4.4, there would be reduced potential for regional retail development at the intersection of I-15 and 11400 South and neighborhood retail development in the vicinity of 11400 South and Redwood Road. While regional and local retail and neighborhood development would still occur, it may not occur at the projected scale or timetable without transportation improvements.

Alternative 1

Direct

Alternative 1 would convert approximately 54 acres of commercial and residential land use areas to transportation land use. Approximately 1.25 acres of the Jordan River Parkway open space would be converted to transportation-related right-of-way (0.22 acres at 12300 South, 0.88 acres at 11400 South, and 0.15 acres at 10600 South), but the Parkway trails would be accommodated at all river crossing locations.

Indirect

As discussed in Section 4.4, *Economic Development*, improved access that would occur under Alternative 1 would likely result in approximately 10 acres of additional neighborhood scale retail development at 11400 South and Redwood Road (see Figure 4-1). It would also likely result in an estimated 137 acres of increased regional retail development in the area near I-15 and 11400 South.

Residential development would be expected to occur in accordance with the cities' Master Plans, and to the same extent as the No Build Alternative. The preserved corridor within the Jordan River Parkway would be maintained. Areas of ongoing and planned residential development already have adequate access and no induced residential growth would be expected as a result of implementing Alternative 1. However, the improved access resulting from the completion of 11400 South between 640 West and 1300 West may result in quicker completion of planned residential development activities.

Alternative 3A

Direct

Widening of existing roads would require the conversion of approximately 40 acres of commercial and residential land use areas to transportation use. Approximately 0.37 acres of the Jordan River Parkway open space would be converted to

transportation-related right-of-way (0.22 acres at 12300 South and 0.15 acres at 10600 South), but the Parkway trails would be accommodated at these expanded river crossing locations. Alternative 3A does not involve a new crossing of the Jordan River or any improvements to 11400 South.

Indirect

As discussed in Section 4.4, *Economic Development*, Alternative 3A is not expected to add any additional neighborhood-scale retail development within the study area. This demand would be met at community or regional scale developments along Bangerter Highway. Likewise, Alternative 3A would not add any additional regional retail development to the study area. This is because roadway improvements for Alternative 3A occur along corridors that are already developed and there would be no new or improved new accesses.

Residential development would be expected to occur in accordance with the cities' Master Plans, and to the same extent as the No Build Alternative.

Alternative 4

Direct

Land use impacts include approximately 39 acres of residential or commercial land use to be converted to transportation land use. Approximately 1.03 acres of the Jordan River Parkway open space would be converted to transportation-related right-of-way (0.88 acres at 11400 South and 0.15 acres at 10600 South), but the Parkway trails would be accommodated at these river crossing locations.

Indirect

As discussed in Section 4.4, *Economic Development*, improved access that would occur under Alternative 4 would likely result in approximately 10 acres of additional neighborhood scale retail development at 11400 South and Redwood Road (see Figure 4-1). It would also likely result in an estimated 129 acres of

increased regional retail development in the area near I-15 and 11400 South.

Residential development would be expected to occur in accordance with the cities' Master Plans, and to the same extent as the No Build Alternative. The preserved corridor within the Jordan River Parkway would be maintained. Areas of ongoing and planned residential development already have adequate access and no induced residential growth would be expected as a result of implementing Alternative 4. However, the improved access resulting from the new interchange and the completion of 11400 South between 640 West and 1300 West may result in quicker completion of planned residential development activities.

Alternative 7

Direct

Land use impacts associated with Alternative 7 would include approximately 46 acres converted from residential or commercial land use to transportation land use. Approximately 1.03 acres of the Jordan River Parkway open space would be converted to transportation-related right-of-way (0.88 acres at 11400 South and 0.15 acres at 10600 South), but the Parkway trails would be accommodated at these river crossing locations.

Indirect

As discussed in Section 4.4, *Economic Development*, improved access that would occur under Alternative 1 would likely result in approximately 10 acres of additional neighborhood scale retail development at 11400 South and Redwood Road (see Figure 4-1). It would also likely result in an estimated 132 acres of increased regional retail development in the area near I-15 and 11400 South.

Residential development would be expected to occur in accordance with the cities' Master Plans, and to the same extent as the No Build Alternative. The preserved corridor within the Jordan River Parkway would be maintained. Areas of ongoing and

planned residential development already have adequate access and no induced residential growth would be expected as a result of implementing Alternative 7. However, the improved access resulting from the completion of 11400 South between 640 West and 1300 West may result in quicker completion of planned residential development activities.

4.1.1 Mitigation Measures

Measures to mitigate land use impacts include negotiating with landowners to determine the most practicable solution related to property acquisitions. Mitigation measures for property acquisitions are discussed in more detail in Section 4.3.2.

The Jordan River Parkway trails would be accommodated at all roadway crossings. UDOT would maintain access to existing farmlands by purchasing ROW easements or making minor alignment alternations where necessary. All affected canals or ditches would be reconstructed to preserve irrigation waters.

4.2 Prime and Unique Farmland, and Farmland of Local Importance

Coordination with the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) indicated that since all land within the study area is incorporated into one of the four cities (Draper, Riverton, Sandy, and South Jordan), there would be no impacts to important farmlands as a result of any of the alternatives associated with the proposed project (see coordination letter in Appendix D).

4.3 Direct and Indirect Social Impacts

Social impacts related to each alternative are focused both on impacts to areas along corridors proposed to undergo transportation improvements, as well as the study area in general. Social attributes include objective measures such as public safety, community economic vitality, and access to employment and

income opportunities, as well as subjective measures such as community values, levels of satisfaction with community conditions, and attachment to the community. Some quality of life elements, such as those involving availability of services, employment opportunities, and transportation system adequacy, are most appropriately considered at a community-wide or even regional scale. Others, such as those involving community cohesion and attachment, tend to be relevant at more localized scales, often at the neighborhood level.

4.3.1 Community Quality/Cohesion

Short-term impacts to the project study area in general consist of traffic delays and rerouting during construction. Long-term effects include both how effectively an alternative would address residents' concerns about traffic congestion and improved east-west traffic mobility, and how levels of social integration and cohesion in the local neighborhoods surrounding the road corridors affected by reconstruction might be altered as a result of project implementation.

Impacts to localized neighborhoods along corridors proposed to undergo transportation improvements are dependent on the alternative and are discussed below.

No Build Alternative

Community quality/cohesion impacts for the No Build Alternative are related to heavier traffic volumes along existing streets. As growth continues, if no new roadway construction were completed in the study area, traffic congestion and travel times would increase, resulting in reduced satisfaction levels among the majority of area residents who have indicated strong preferences for transportation improvements to reduce traffic congestion and improve mobility throughout the project area. As the 10400/10600 and 12300/12600 South corridors currently experience the greatest east-west traffic flows in the study area, the No Build Alternative would most likely result in even greater traffic flows

along these corridors. The Community Social Assessment (Appendix E) found that on a localized level, the sense of community felt in areas along routes that experience heavier traffic volumes and subsequent congestion would most likely deteriorate, due to a tendency for neighborhood socializing, outdoor activities, and levels of community attachment to be reduced in neighborhoods characterized by high traffic volumes and traffic noise (Krannich 2004).

Alternative1

Direct

Based on the community social assessment performed for this FEIS, residents in the study area were fairly positive regarding this alternative's ability to reduce traffic congestion and improve east-west mobility, but voiced concern over the traffic delays and rerouting during construction. This alternative would be the most disruptive in terms of impacts to local neighborhoods because of the number of roadway corridors affected. However, access to I-15 and general mobility along the study area arterials would improve for these communities.

Impacts to local neighborhood quality/cohesion for this alternative are related to constructing a new roadway along the 11400 South corridor from 740 West to 1300 West and expanded roadways in other portions of the study area. The communities located in these vicinities would see increased traffic levels and would also experience the impacts of having an expanded roadway in their neighborhoods.

Due to right-of-way acquisitions, some residences and businesses along 10400/10600 South, 11400 South, and 12300/12600 South would be relocated (see Section 4.3.2). These relocations would disrupt the affected residents and business owners, as well as business patrons and suppliers. Although some residents may prefer to be relocated rather than to remain in a neighborhood altered by road reconstruction, others are strongly attached to

their neighborhoods and reluctant to leave. Relocated residents, particularly those who do not wish to leave, may experience stress-related effects when their move to a new location results in a loss of established neighborhood-based friendships and social networks. In addition, some residents not required to relocate could experience disruptive effects on social integration and cohesion due to the departure of neighbors who they often know well and interact with frequently. Also, conditions associated with the presence of a wider roadway may cause established residents to become dissatisfied and voluntarily move from the area. The resulting increases in residential turnover and transiency in corridor-adjacent neighborhoods would exacerbate the deterioration of social integration and cohesion in these localized areas.

Such effects would be less pronounced in the 12300/12600 South and the 10400/10600 South corridors, since previous or scheduled transportation improvements have already caused or will soon result in lowered levels of social integration and cohesion in the neighborhoods immediately adjoining these corridors. However, in the short term, some area residents could be frustrated by traffic disruptions associated with further reconstruction of these roadways. Neighborhoods located a block or more away from the affected corridors would not experience significant disruptive effects on social integration and cohesion, since these areas would not be directly affected by project-induced relocations or the declines in neighborhood socializing and outdoor activity that tend to occur in areas bisected by wider roadways.

The roadway expansion and construction of the new roadway segment would alter the physical and social environments experienced by residents living along 11400 South. Residents living adjacent to or in close proximity to that road corridor would experience a variety of short-term impacts, including exposure to construction noise, dust, access difficulties, and traffic delays that

would negatively affect levels of satisfaction with neighborhood conditions and also make it more difficult to engage in outdoor activities and neighborhood socializing that contribute to neighborhood social cohesion. Adverse long-term effects would include life disruption and a severing of neighborhood-based social ties and attachments among those whose homes would require removal. Some residents remaining in corridor-adjacent homes along 11400 South would experience an erosion of localized social ties and neighborhood cohesion due in part to the relocation of some of their neighbors, as well as to reduction in neighborhood socializing and outdoor activities that may accompany the presence of wider streets and the large cut and fill walls required for the new roadway between River Front Parkway and Marco Polo Drive.

A 106-foot-wide corridor along the proposed 11400 South alignment has been preserved by South Jordan from River Front Parkway to Midas Creek, just east of 1300 West, in anticipation of roadway construction. Home construction has occurred around this preserved corridor and most residents of the area are aware that South Jordan preserved the corridor for a future road. The empty corridor is now a conglomeration of piles of dirt, weeds, and vacant areas. Area residents use it as a footpath to reach River Front Parkway and the Jordan River Parkway Trail. If 11400 South were constructed in this area, access to River Front Parkway and the Jordan River Parkway Trail would be improved for pedestrians and bicyclists. Paved sidewalks on both sides of the road would tie in to sidewalks on River Front Parkway.

Indirect

Indirect effects on community quality/cohesion would occur as the reconstruction of 10400/10600 South, 11400 South, and 12300/12600 South roadways would likely result in induced growth of commercial development and further alteration of adjoining neighborhoods that at present are almost exclusively residential in character. Such development effects would result in

removal of some residential properties, loss of open space, rerouting of traffic patterns, and areas of increased noise and night lighting that would likely generate dissatisfaction among established residents in close proximity and an increased propensity for some residents to move from the area.

Alternative 3A

Direct

Residents in the study area were fairly positive regarding this alternative's ability to reduce traffic congestion and improve east-west mobility. Concerns regarding traffic delays and rerouting during construction for this alternative were not as great as those for Alternative 1. Localized impacts on neighborhood-level cohesion and social integration would be less widespread under this alternative than under Alternative 1 because reconstruction and road realignment would occur on just two rather than all three of the major east-west corridors in the study area.

Alternative 3A impacts the communities along 10400/10600 South and 12300/12600 South similar to Alternative 1. Since this alternative does not expand 11400 South, there would be no local community impacts along this roadway. Due to right-of-way acquisitions, some residences and businesses along 10400/10600 South and 12300/12600 South would be relocated (see Section 4.3.2). These relocations would disrupt the affected residents and business owners, as well as business patrons and suppliers. Although some residents may prefer to be relocated rather than to remain in a neighborhood altered by road reconstruction, others are strongly attached to their neighborhoods and reluctant to leave. Relocated residents, particularly those who do not wish to leave, may experience stress-related effects when their move to a new location results in a loss of established neighborhood-based friendships and social networks. In addition, some residents not required to relocate could experience disruptive effects on social integration and cohesion due to the departure of neighbors who they often know well and interact with frequently. Also, conditions

associated with the presence of a wider roadway may cause established residents to become dissatisfied and voluntarily move from the area. The resulting increases in residential turnover and transiency in corridor-adjacent neighborhoods would exacerbate the deterioration of social integration and cohesion in these localized areas.

Indirect

Indirect effects on community quality/cohesion would be similar to those for Alternative 1 but not as pronounced, and would occur as the reconstruction of 10400/10600 South and 12300/12600 South roadways would result in removal of some residential properties, loss of open space, increased localized traffic volumes, increased levels of noise, and other disturbances that would likely generate dissatisfaction among many established residents and an increased propensity for some residents to move from the area. Without the new river crossing, neighborhood traffic may increase in some areas as residents try to make their way to regional development along 11400 South. Traffic rerouting associated with construction activities along 10400/10600 South and 12300/12600 South may temporarily increase traffic and associated noise levels along 11400 South and residential neighborhoods along 11400 South.

Alternative 4

Direct

Residents in the study area were positive regarding this alternative's ability to reduce traffic congestion and improve east-west mobility, with favorable attitudes that traffic flows would be more evenly distributed throughout the study area. Residents indicated this alternative would be the least disruptive regarding traffic delays and rerouting due to construction activity. This alternative would be more disruptive than Alternative 3A, but less disruptive than Alternative 1 in terms of impacts to local neighborhoods.

For Alternative 4, localized impacts to 10400/10600 South communities would be limited to those areas east of Redwood Road, which is largely a commercialized area. As no further improvements would take place along the primarily residential areas of 10400 South and no improvements would take place along 12300/12600 South for this alternative, these communities would not experience any negative long-term impacts to community quality and cohesion; rather, they would experience the benefits of reduced traffic along their route, in the long-term. Motorists using I-15 to travel to/from the southwest area of Salt Lake Valley would have a new interchange option for accessing I-15 at 11400 South. The resulting traffic decrease along 10400/10600 South and along 12300/12600 South would beneficially affect the community cohesion and quality of these areas.

A 106-foot-wide corridor along the proposed 11400 South alignment has been preserved by South Jordan from River Front Parkway to Midas Creek, just east of 1300 West, in anticipation of roadway construction. Home construction has occurred around this preserved corridor and most residents of the area are aware that South Jordan preserved the corridor for a future road. The empty corridor is now a conglomeration of piles of dirt, weeds, and vacant areas. Area residents use it as a footpath to reach River Front Parkway and the Jordan River Parkway Trail. If 11400 South were constructed in this area, access to River Front Parkway and the Jordan River Parkway Trail would be improved for pedestrians and bicyclists. Access to I-15 and mobility along the study area arterials would improve for these communities. However, the new roadway would separate the neighborhoods adjacent to the preserved corridor. Access to I-15 and mobility along the study area arterials would improve for these communities.

Indirect

Indirect effects on community quality/cohesion would be similar to those for Alternative 1 and would occur as the reconstruction of 11400 South and the new freeway interchange would result in

induced growth of commercial development and further alteration of adjoining neighborhoods along 11400 South that are primarily residential in character. As with Alternative 1, development effects would result in removal of some residential properties, loss of open space, increased localized traffic volumes, increased levels of noise and night lighting, and other disturbances that would likely generate dissatisfaction among many established residents and an increased propensity for some residents to move from the area.

Alternative 7

Residents in the study area were positive regarding this alternative's ability to reduce traffic congestion and improve east-west mobility, but they were aware that access to I-15 does not improve with this alternative.

Localized impacts to 10400/10600 South communities would be limited to those areas east of Redwood Road, which is largely a commercialized area. As no further improvements would take place along the primarily residential areas of 10400 South and no improvements would take place along 12300/12600 South for this alternative, these communities would not experience any negative long-term impacts to community quality and cohesion; rather, they would experience the benefits of reduced traffic along their route, in the long-term. However, without a new I-15 interchange at 11400 South, traffic would not decrease along 10400/10600 South and 12300/12600 South to the same level as with Alternative 4.

A 106-foot-wide corridor along the proposed 11400 South alignment has been preserved by South Jordan from River Front Parkway to Midas Creek, just east of 1300 West, in anticipation of roadway construction. Home construction has occurred around this preserved corridor and most residents of the area are aware that South Jordan preserved the corridor for a future road. The empty corridor is now a conglomeration of piles of dirt, weeds, and vacant areas. Area residents use it as a footpath to reach River Front Parkway and the Jordan River Parkway Trail. If 11400 South

were constructed in this area, access to River Front Parkway and the Jordan River Parkway Trail would be improved for pedestrians and bicyclists. Access to I-15 and mobility along the study area arterials would improve for these communities. However, the new roadway would separate the neighborhoods adjacent to the preserved corridor.

Indirect

Indirect effects on community quality/cohesion would occur as the reconstruction of 10400/10600 South and 11400 South roadways would result in induced growth of commercial development and further alteration of adjoining neighborhoods along 11400 South that are primarily residential in character. As with Alternative 1, development effects would result in removal of some residential properties, loss of open space, increased localized traffic volumes, increased levels of noise and night lighting, and other disturbances that would likely generate dissatisfaction among many established residents and an increased propensity for some residents to move from the area.

4.3.1.1 Mitigation Measures for Community Impacts

Mitigation measures to reduce negative impacts on community cohesion for all Build Alternatives include improving pedestrian facilities (such as sidewalks and crosswalks), replacing fencing and/or vegetative screens, providing comparable housing in the instance of relocations, providing noise barriers where warranted, and enforcing traffic speed limits. These mitigation measures would help promote outdoor activity and interactions among residents, enhance the privacy of residents whose properties adjoin affected road corridors, and reduce disturbance impacts associated with increased traffic volume and noise. Pedestrian and traffic mitigation measures are discussed in Section 3.4.21. Noise mitigation measures are discussed in Section 4.7.1.

Under Alternatives 1, 4, and 7, a frontage road along the proposed widened 11400 South roadway would be planned to intersect 11400 South at 700 West, providing residents in the vicinity north

and south of 11400 South at the 700 West area a signalized access to their neighborhoods for vehicles and pedestrians.

4.3.2 Property Acquisitions and Relocations

The No Build Alternative would not require any property acquisitions or right-of-way impacts. Property acquisitions, both partial acquisitions (strip takes) and relocations, would be required under all of the Build Alternatives. Relocations are necessary in instances when transportation improvements require the acquisition of real property on which a structure exists, or when the amount of real property acquired would result in an impractical situation if the residential or business activity were not relocated to a more suitable site.

Table 4-2 lists the addresses of the relocations required for each alternative. It also shows the total number of residential and commercial relocations required for each alternative. As shown in the table, Alternative 1 has the greatest number of relocations for any of the Build Alternatives, while Alternatives 4 and 7 have the least.

**Table 4-2.
Relocations by Alternative**

Address	No Build	Alt 1	Alt 3A	Alt 4	Alt 7
10419 South 3010 West		X	X		
2730 West 10400 South		X	X		
2680 West 10400 South; Sinclair Gas Station*		X	X		
2617 West Cherry Park Lane		X	X		
1954 West Gladys Circle		X	X		X
10418 South Tarali Court		X	X		X
10404 South Redwood Rd; Beehive Credit Union*		X	X		X
10381 South Redwood Rd (McDonald's)*		X	X		X

**Table 4-2. (cont.)
Relocations by Alternative**

Address	No Build	Alt 1	Alt 3A	Alt 4	Alt 7
1530 West 10400 South		X	X		X
1494 West 10400 South		X	X		X
915 West 10550 South		X	X		X
3210 West 11400 South		X		X	X
3193 West 11400 South		X		X	X
11384 South 2865 West		X		X	X
11389 South 2865 West		X		X	X
2800 West 11400 South		X		X	X
2744 West 11400 South		X		X	X
2541 West 11370 South		X		X	X
11416 South Chapel Rim Way		X		X	X
11413 South Charter Pointe Rd		X		X	X
1602 West 11400 South		X		X	X
1465 West 11400 South		X		X	X
11407 South 1300 West **		X		X	X
1163 West Annika Cir (Possible Relocation)		X		X	X
11392 South Trent Drive		X		X	X
11381 South Trent Drive (Possible Relocation)		X		X	X
716 West 11400 South		X		X	X
706 West 11400 South		X		X	X
696 West 11400 South		X		X	X

Address	No Build	Alt 1	Alt 3A	Alt 4	Alt 7
665 West 11400 South		X		X	X
637 West 11400 South		X		X	X
633 West 11400 South		X		X	X
589 West 11400 South		X		X	X
11420 South 300 West		X		X	X
175 West 11400 South **		X		X	X
180 West 11400 South **		X		X	X
170 West 11400 South **		X		X	X
3516 West 12600 South		X	X		
3492 West 12600 South		X	X		
3434 West 12600 South		X	X		
3410 West 12600 South		X	X		
3398 West 12600 South		X	X		
3396 West 12600 South		X	X		
12580 South Janice Dr		X	X		
12575 South Elm Meadows Rd		X	X		
3114 West Martinez Way		X	X		
3092 West 12600 South		X	X		
3072 West 12600 South		X	X		
3040 West 12600 South		X	X		
3018 West 12600 South		X	X		
2992 West 12600 South		X	X		
2779 West 12600 South; cinder block building* and **		X	X		

**Table 4-2. (cont.)
Relocations by Alternative**

Address	No Build	Alt 1	Alt 3A	Alt 4	Alt 7
2707 West 12600 South; Maverick Store*		X	X		
2595 West 12600 South		X	X		
2522 West 12600 South; Jordan Credit Union*		X	X		
2364 West 12600 South; Professional building*		X	X		
1804 West 12600 South; Subway/Little Caesar*		X	X		
1625 West 12600 South; Jiffy Lube*		X	X		
1371 West 12600 South		X	X		
1605 West 12600 South* (strip mall with Scrapbook Depot, Nail Jail & more)		X	X		
1592 West 12600 South; River queen's Drive Inn*		X	X		
1369 West 12600 South; Mom's Floral & Gift*		X	X		
1345 West 12600 South; Riverton Family Dentistry*		X	X		
883 West Stephens View Way		X	X		
877 West Stephens View Way		X	X		
863 West Stephens View Way		X	X		
857 West Stephens View Way		X	X		
843 West Stephens View Way		X	X		
837 West Stephens View Way		X	X		
833 West Stephens View Way		X	X		
12272 South Stephens View Cir		X	X		
736 West 12300 South **		X	X		
271 West 12300 South		X	X		
191 West 12600 South; Machine Shop*		X	X		

Address		No Build	Alt 1	Alt 3A	Alt 4	Alt 7
11017 S. Jordan Gateway; Utah Water Sports*			X	X		
11810 South State Street*			X	X		
* = Commercial	# Residential	0	60	34	26	31
** = Historic	# Commercial	0	16	16	0	2
	Total	0	76	50	26	33

Table 4-3 shows the number of strip takes required under each alternative. This table also shows the total ROW acreage that would be acquired as strip takes by alternative.

In addition to ROW purchases, UDOT would require construction easements at various locations along the project corridors. These easements would be temporary and would expire at the conclusion of the construction period or on a specified date.

**Table 4-3.
Partial Property Impacts by Alternative**

	No Build	Alt. 1	Alt. 3A	Alt. 4	Alt. 7
<i>Residential Strip Takes</i>					
Number	0	382	266	130	190
Acres	0	34	17	20	27
<i>Commercial Strip Takes</i>					
Number	0	166	146	28	93
Acres	0	14	20	3	16
Total Number	0	548	412	158	283
Total Acres	0	48	37	23	43

4.3.2.1 Mitigation Measures for Property Acquisitions

Property acquisitions, both partial and total, would be obtained according to federal regulations and UDOT policies that include compensation at fair market value. If property remaining after a partial property purchase is determined to have little value or utility, UDOT would offer to purchase the remainder. The property owner would have a choice whether to sell or keep the remaining property. In the case of partial property acquisitions, if remaining property suffers a loss in value, damages would be paid. The property damage amount and partial taking value cannot exceed the market value of the whole property (UDOT, 2003). UDOT would comply with Title VI of the Civil Rights Act of 1964 and the Uniform Relocation Assistance and Real Property Acquisition Act of 1970, as amended, when considering property acquisitions.

In the instance of relocations of residences or businesses, similar property qualities would be sought out to the greatest practicable extent.

4.3.3 Environmental Justice

Executive Order 12898, issued on February 11, 1994, states, “To the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories...”

The FHWA issued Order 6640.23, “FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” to address environmental justice populations: The FHWA Order states, “It is FHWA’s longstanding policy to actively ensure nondiscrimination in Federally funded activities. Furthermore, it is FHWA’s continuing policy to identify and prevent

discriminatory effects by actively administering its programs, policies, and activities to ensure that social impacts to communities and people are recognized early and continually throughout the transportation decisionmaking process—from early planning through implementation.”

The FHWA Order also states, “Disproportionately High and Adverse Effect on Minority and Low-Income Populations means an adverse effect that: (1) is predominately borne by a minority population and/or a low-income population; or (2) will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the nonminority population and/or nonlow-income population.”

To comply with Executive Order 12898 and FHWA Order 6640.23, an environmental justice analysis was completed to determine whether the proposed project had the potential to exert disparately high and/or adverse impacts upon minority or low-income populations and to assess if such impacts would be disproportionate in comparison to the total population ratio. As discussed in more detail in Section 3.3.2, door-to-door surveys were conducted along each corridor that would be affected by one of the Build Alternatives, with an 80 percent response rate. No unusual concentrations of minority or low-income populations were identified along the project corridors affected by the Build Alternatives. Only six out of the 192 homes surveyed along the 12300/12600 South, 11400 South, and 10400/10600 South Corridors reported household income levels below the official Health and Human Services poverty thresholds and no obvious spatial clustering was observed. For households in which one or more person was identified as being a member of a racial or ethnic minority group, no obvious spatial clustering was observed. Likewise, the percentage of minority populations in the study area, as a whole, is comparable or less than the percentage of minority populations in the state of Utah, Salt Lake County, and the four

cities that comprise the study area; and the median household income in the study area, as a whole, is at or above the median household income in the state, county, and cities.

No disproportionate impacts to minority or low-income populations would be realized along the proposed improvement corridors for any alternative. There are no significant differences between the alternatives, relative to environmental justice impacts.

4.3.4 Safety

Safety concerns include pedestrian, bicyclist, traffic, and other factors, such as emergency vehicle response. This section discusses impacts to safety for each alternative.

Pedestrian and Bicycle Facilities

Sidewalks and pedestrian access ramps are planned along the entire length of improvements for all Build Alternatives. These facilities would be constructed in compliance with guidelines set forth in the Americans with Disabilities Act of 1990 (ADA). A park strip would be constructed between the roadway and the sidewalk in most areas to separate pedestrians from vehicles. In some areas, exceptions to the typical sections are proposed. These exceptions are discussed in Section 2.4.2. In such instances, sidewalk and/or shoulder widths are altered to maintain the level of safety required for pedestrian and bicycle use.

Each Build Alternative would also include bicycle routes. These would generally measure 4 feet in width and would be included in the 10-foot shoulders provided along the six lane facilities and within the 8-foot shoulders along the four lane facilities. These bicycle routes would be considered Class 2 routes, meaning the bicycle route is a lane designated by striping, signing, and pavement markings on the roadway. For comparison, Class 1 routes are dedicated paths separated from vehicular roadways and Class 3 routes share the roadway with vehicular traffic and generally consist of wide, paved shoulders.

No Build Alternative

Conditions under the No Build Alternative would be similar to existing conditions. No additional bike lanes or sidewalks would be provided along 11400 South. Due to an expected increase in traffic flows and congestion on existing roadways, pedestrian and bicycle safety may deteriorate under this alternative.

Alternative 1

Transportation improvements along 10400/10600 South, 12600/12300 South, and Jordan Gateway would require additional traffic signal pedestrian green times because of the longer time required to cross the wider streets.

The construction of a new roadway on 11400 South between 1300 West and River Front Parkway would have elementary school-age children crossing the roadway to access South Jordan Elementary, located at 11205 South Black Cherry Way. South Jordan Elementary School's Safe Walking Route Plan for the 2004/2005 school year shows that children would cross 11400 South at 1300 West, Marco Polo Lane, Chapel View Drive, or River Front Parkway.

1300 West is currently signalized, and River Front Parkway would be signalized if 11400 South were constructed. These intersections would include push buttons and pedestrian signals. School-age children crossing at these intersections could safely do so by using the signalized crossings. If the intersection of Marco Polo Lane and 11400 South is maintained as a school route, it would have the appropriate legs marked with a school crosswalk and may also require a reduced-speed school zone with a Jordan School District crossing guard. Jordan School District identifies safe walking routes and crossing guard locations for students, based on student population demographics and traffic concerns. The over- and underpasses at 11000 and 11800 South would permit more traffic along those streets east of I-15. School-age children currently cross those streets to attend

Crescent Elementary and Crescent View Middle Schools. The existing crossings that the children use would be evaluated to determine of modifications would be necessary.

Alternative 3A

As Alternative 3A does not include transportation improvements to 11400 South, no pedestrian safety or bicycle lane improvements would occur on 11400 South for this alternative. Transportation improvements along 10400/10600 South, 12600/12300 South, and Jordan Gateway would require additional traffic signal pedestrian green times because of the longer time required to cross the wider streets. The over- and underpasses at 11000 and 11800 South would permit more traffic along those streets east of I-15. School-age children currently cross those streets to attend Crescent Elementary and Crescent View Middle Schools. The existing crossings that the children use would be evaluated to determine of modifications would be necessary.

Alternative 4

Alternative 4 would see pedestrian and bicycle facility impacts similar to those for Alternative 1. However, as no additional widening of 12300/12600 South or 10400 South west of Redwood Road would occur, additional traffic signal times for pedestrians would not be required. In these roadway corridors, pedestrian and bicycle facilities already exist or are planned as part of previously approved road improvement projects.

The construction of a new roadway on 11400 South between 1300 West and River Front Parkway would have elementary school-age children crossing the roadway to access South Jordan Elementary, located at 11205 South Black Cherry Way. South Jordan Elementary School's Safe Walking Route Plan for the 2004/2005 school year shows that children would cross 11400 South at 1300 West, Marco Polo Lane, Chapel View Drive, or River Front Parkway.

1300 West is currently signalized, and River Front Parkway would be signalized if 11400 South were constructed. These intersections would include push buttons and pedestrian signals. School-age children crossing at these intersections could safely do so by using the signalized crossings. If the intersection of Marco Polo Lane and 11400 South is maintained as a school route, it would have the appropriate legs marked with a school crosswalk and may also require a reduced-speed school zone with a Jordan School District crossing guard. Jordan School District identifies safe walking routes and crossing guard locations for students, based on student population demographics and traffic concerns.

Alternative 7

The construction of a new roadway on 11400 South between 1300 West and River Front Parkway would have elementary school-age children crossing the roadway to access South Jordan Elementary, located at 11205 South Black Cherry Way. South Jordan Elementary School's Safe Walking Route Plan for the 2004/2005 school year shows that children would cross 11400 South at 1300 West, Marco Polo Lane, Chapel View Drive, or River Front Parkway.

1300 West is currently signalized, and River Front Parkway would be signalized if 11400 South were constructed. These intersections would include push buttons and pedestrian signals. School-age children crossing at these intersections could safely do so by using the signalized crossings. If the intersection of Marco Polo Lane and 11400 South is maintained as a school route, it would have the appropriate legs marked with a school crosswalk and may also require a reduced-speed school zone with a Jordan School District crossing guard. Jordan School District identifies safe walking routes and crossing guard locations for students, based on student population demographics and traffic concerns.

Traffic Safety

All four Build Alternatives would be designed to meet current AASHTO design standards to help reduce the potential for traffic collisions. Raised medians with barrier-type curbing would be installed at certain locations as a safety measure to reduce collisions resulting from left turns and U-turns at intersections and from conflicting mid-block left turns.

UDOT installs medians on principal and minor urban arterials to improve safety. Studies have shown that raised medians prevent crashes caused by crossover traffic, reduce headlight glare, and provide pedestrian protection. Raised medians have been associated with less right angle, sideswipe, head on, and rear end collisions. Raised medians also allow pedestrians to cross the road in two segments rather than one, giving them less distance to travel before reaching a safe zone.

The alternative figures in Section 2 show proposed median locations. Median placement would be coordinated with the local city planning and engineering departments during final design to determine appropriate access points so as to not inhibit future development and to reduce impacts to existing businesses and residences. However, as additional median openings may affect safety and traffic operations, the UDOT guidelines for mid-block openings will be followed. These guidelines establish minimum lengths between mid-block openings for major and minor arterials in current and projected urban areas (UDOT 2005).

All four Build Alternatives include new traffic signals at certain areas along the improved roadways. Table 4-4 lists the intersections that are already signalized as well as those proposed to be signalized for the various alternatives.

Table 4-4. Existing and New Traffic Signals by Alternative

Intersections	Alt 1	Alt 3A	Alt 4	Alt 7
<i>10400/10600 South Intersections</i>				
Bangerter Highway (existing)	X	X		
2700 West (existing)	X	X		
Redwood Road (existing)	X	X	X	X
1300 West (existing)	X	X	X	X
Jordan Gateway (existing)	X	X	X	X
State Street (existing)		X		
River Front Parkway (new)	X	X	X	X
11000 South/Jordan Gateway (new)	X	X		
<i>11400 South Intersections</i>				
Bangerter Highway (existing)	X	X	X	X
2700 West (existing)	X	X	X	X
Redwood Road (existing)	X	X	X	X
1300 West (existing)	X	X	X	X
State Street (existing)	X	X	X	X
River Front Parkway (new)	X		X	X
700 West (new)	X	X	X	X
I-15 Interchange (new)			X	
Jordan Gateway (new)	X	X	X	X
<i>12300/12600 South Intersections</i>				
11800 South/Lone Peak Parkway (existing)	X	X		
Bangerter Highway (existing)	X	X		
2700 West (existing)	X	X		
Redwood Road (existing)	X	X		
1300 West (existing)	X	X		
700 West (existing)	X	X		
Lone Peak Parkway (existing)	X	X		
State Street (existing)	X	X	X	X

Bold font indicates intersection with new traffic signal.

No Build Alternative

Under the No Build Alternative, roadway conditions would remain as they currently are, however, traffic levels would continue to increase, resulting in increased congestion and driver frustration.

Alternative 1

Under Alternative 1, 10-foot shoulders would be constructed along 10400/10600 South and 12300/12600 South, similar to the current or planned conditions for those roadways. An 8-foot shoulder would be included along the newly constructed 11400 South. The shoulders would provide a refuge for disabled vehicles to safely move out of traffic as well as allow a turnout for traffic to safely avoid emergency response vehicles. The shoulders further increase distance between vehicles and pedestrians and also provide storage for snow removal during winter. The newly constructed 11400 South roadway would be designed for a speed limit of 45 miles per hour (mph), and a posted speed limit of 40 mph would initially be established. Law enforcement agencies periodically monitor traffic speeds along roadways to determine if the posted speed limit is appropriate. Depending on speeds traveled along roadways and safety concerns, the posted speed limit may change in the future from what would be initially established. Speed limits on the other roadways that would undergo improvements with this alternative would remain at their current posted levels, unless law enforcement determines otherwise, based on speed monitoring.

Construction of 11400 South between 1300 West and River Front Parkway would help reduce traffic that currently travels through the residential streets of the Palisades subdivision to access River Front Parkway, which would improve traffic safety along these neighborhood streets.

Alternative 3A

Under Alternative 3A, 10-foot shoulders would be constructed along 10400/10600 South and 12300/12600 South, similar to the

current or planned conditions for those roadways. As discussed under Alternative 1, shoulders provide refuge for disabled vehicles, safe pull-out to avoid emergency vehicles, increased distance between pedestrians and vehicles, and storage for snow removal.

Alternative 4

Under Alternative 4, 10-foot shoulders would be provided along 10600 South and 8-foot shoulders would be provided along 11400 South. As discussed under Alternative 1, shoulders provide refuge for disabled vehicles, safe pull out to avoid emergency vehicles, increased distance between pedestrians and vehicles, and storage for snow removal.

As with Alternative 1, 11400 South would be designed for a speed limit of 45 mph and a posted speed limit of 40 mph would initially be established. Law enforcement agencies periodically monitor traffic speeds along roadways to determine if the posted speed limit is appropriate. Depending on speeds traveled along roadways and safety concerns, the posted speed limit may change in the future from what would be initially established. Speed limits on the other roadways that would undergo improvements with this alternative would remain at their current posted levels, unless law enforcement determines otherwise, based on speed monitoring.

Construction of 11400 South between 1300 West and River Front Parkway would help reduce traffic that currently travels through the residential streets of the Palisades subdivision to access River Front Parkway, which would improve traffic safety along these neighborhood streets. The new interchange at I-15 would be constructed per AASHTO guidelines and would include appropriate street lighting.

Alternative 7

Under Alternative 7, ten-foot shoulders would be provided along 10600 South and 8-foot shoulders would be provided along 11400

South. Shoulders provide refuge for disabled vehicles, safe pull out to avoid emergency vehicles, increased distance between pedestrians and vehicles, and storage for snow removal.

11400 South would be designed for a speed limit of 45 mph and a posted speed limit of 40 mph would initially be established. Law enforcement agencies periodically monitor traffic speeds along roadways to determine if the posted speed limit is appropriate. Depending on speeds traveled along roadways and safety concerns, the posted speed limit may change in the future from what would be initially established. Speed limits on the other roadways that would undergo improvements with this alternative would remain at their current posted levels, unless law enforcement determines otherwise, based on speed monitoring.

Construction of 11400 South between 1300 West and River Front Parkway would help reduce traffic that currently travels through the residential streets of the Palisades subdivision to access River Front Parkway, which would improve traffic safety along these neighborhood streets.

Other Safety Considerations

The current grade-separated Union Pacific Railroad (UPRR) crossings at 10600 South and 12300 South would be maintained. Under the No Build Alternative and Alternative 3A, the at-grade crossing at 11400 South would be maintained. This would not alleviate the potential of train-vehicle collisions; however, under these two alternatives, traffic numbers in this vicinity would be much less than the traffic numbers that would be experienced under the other alternatives. This action could potentially add to emergency vehicle response times, however.

For Alternatives 1, 4, and 7, a grade separation would be provided at 11400 South and the UPRR crossing. This would eliminate the at-grade crossing and eliminate the potential for train-vehicle collisions at this crossing.

Currently, the emergency response time for the portion of South Jordan City east of the Jordan River and north of 11400 South averages 12 minutes, which does not meet the preferred 5-minute maximum. South Jordan emergency response currently has to access this neighborhood via 10600 South, then to Jordan Gateway, and then onto 11400 South. Although Draper has agreed to service this area for South Jordan, the desired system redundancy is not available. Redundancy is desired so that either Draper or South Jordan emergency crews could answer a call in this area within an acceptable response time. If 11400 South were constructed between 1300 West and 700 West, with a crossing of the Jordan River, then the emergency response time to this neighborhood would be reduced significantly and redundancy of service would be improved. Alternative 3A would not improve emergency response times in this neighborhood. Alternatives 1, 4 and 7 would improve emergency response times both by providing a river crossing and also by providing a grade-separated crossing of the railroad.

In the vicinity of 700 West, a frontage road would be developed to serve residents currently living in the area. To facilitate emergency response vehicle access, a second access point to these neighborhoods would be designed.

4.3.4.1 Mitigation Measures

Mitigation measures for safety impacts associated with all of the Build Alternatives include traffic signalizations, crosswalks, and traffic barriers and/or medians. With Alternatives 1, 4, and 7, additional mitigation measures along 11400 South would include frontage road in the vicinity of 740 West with a supplemental right in/right out access, and a grade-separated railroad crossing. A possible enforcement measure for the speed limit on this roadway could include the permanent installation of a device that measures and displays the speed of passing cars, while also displaying the speed limit for the road. In coordination with area residents, making Chapel View a dead end street with a possible pedestrian

underpass and/or making Marco Polo a dead end street would be considered.

4.3.5 Construction Phasing

Construction of a Build Alternative depends on available funding; consequently all the elements of the alternative ultimately selected may not be constructed at one time. Therefore, for each Build Alternative, the impacts of sequentially constructing the different components were evaluated in terms of mobility, community concerns, economic benefits, and costs. Economic impacts associated with alternative phasing are discussed in Section 4.4.3, in the discussion on Net Present Value. This section discusses east-west mobility and community impacts from various phasing options. More details of the mobility analysis are included in Appendix A.

No Build Alternative

Because there is no additional roadway construction associated with the No Build Alternative, no construction sequences were evaluated.

Alternative 1

The sequencing analysis for Alternative 1 shows that if the 11400 South river crossing were constructed first, it would provide the most mobility relief to the study area for corridors crossing the Jordan River. Widening of 10400/10600 South and 12300/12600 South would not need to be completed until 2022.

If widening of 10400/10600 South were constructed first, the river crossing would need to be constructed by 2012 in order to provide acceptable east-west mobility within the study area. If widening of 12300/12600 South were constructed first, the 11400 South river crossing would need to be constructed by 2012 in order to provide acceptable east-west mobility within the study area.

Widening has recently occurred along 10600 South and is currently occurring along 12300/12600 South. Future widening of

10400 South is planned for 2006 under another roadway project. If widening of either of these two roadways were constructed first, some area residents along 10400/10600 South and 12300/12600 South could be frustrated by traffic disruptions associated with further reconstruction of these two roadways so soon after the current/planned construction is complete.

Alternative 3A

The sequencing analysis for Alternative 3A shows that both 10400/10600 South and 12300/2600 South would need to be widened by 2012 in order to provide acceptable east-west mobility within the study area. Widening of Jordan Gateway/Lone Peak Parkway would not need to occur until 2022. As mentioned under Alternative 1, residents and businesses located along either of these east-west corridors have recently or will shortly experience construction disruption. New construction occurring shortly after these projects are completed would cause neighborhood disruption and impacts to businesses including loss of revenue due to reduced access and visibility. Widening Jordan Gateway/Lone Peak Parkway first would not improve east-west mobility within the study area so was not included in the sequencing analysis.

Alternative 4

The sequencing analysis for Alternative 4 shows that if the I-15 Interchange were constructed first, the new 11400 South river crossing would need to be constructed by 2012 in order to provide acceptable mobility within the study area. If the river crossing were constructed first, the widening along 10600 South would not need to occur until 2022. As the sequencing analysis looked at only east-west mobility, the improvements to I-15 mobility realized by the new interchange were not incorporated into the analysis. However, based on the 2030 traffic modeling for I-15, Alternative 4 is the only alternative that would provide the desired LOS improvements along I-15 throughout the study area.

As stated in Section 1, the WFRC 2030 LRP is a financially constrained plan. This means that it contains only those highway and transit facility improvement projects that can be funded through 2030. The implementation of the 2030 LRP was divided into three separate phases to coincide with anticipated financing and revenue streams. Phase 1 projects are planned for 2004-2012, Phase 2 projects for 2013-2022, and Phase 3 projects for 2023-2030. Both the I-15 interchange and the 11400 South river crossing (from I-15 to Redwood Road) components of Alternative 4 are included under Phase 1 of the LRP, indicating that the funding sources to construct these two components are anticipated to be available by 2012.

Residents in the 11400 South/700 West area expressed concerns regarding air quality, noise and safety impacts associated with increased traffic in their neighborhood from Alternative 4, if the 11400 South Interchange is constructed before the river crossing is constructed. These impacts were evaluated, assuming that the interchange was built right away, but the river crossing was not constructed until 2012.

To evaluate these impacts, a traffic analysis was conducted for the Jordan Gateway/11400 South and the 700 West/11400 South intersections to determine traffic levels in the year 2012, both with and without a river crossing, assuming the new freeway interchange was already in place. The traffic study shows that the LOS along 11400 South in the area of 700 West and Jordan Gateway would be similar in 2012 with or without the river crossing. This is because without the river crossing, drivers would continue their current travel patterns due to lack of east-west mobility across the Jordan River at 11400 South.

An additional traffic analysis was done to explain the impacts to Draper City streets beyond the intersections of the 11400 South corridor. This additional analysis looked at both the 700 West corridor and Lone Peak Parkway (See the November 29, 2004 memorandum in the updates to *Appendix A, Traffic Analysis*

Information, included in this FEIS). The analysis shows that in 2012, if the river crossing is not yet constructed, residents living along the 700 West and Lone Peak Parkway corridors would be affected by the increased traffic levels in the study area as commuters make their way north and south to 12300 South and 10600 South to travel west from the freeway. But, as stated previously, because of the lack of east-west mobility at 11400 South, most drivers would be expected to continue their current driving patterns. The planning level volumes generated by the 2012 models show Lone Peak Parkway would be over-capacity under this scenario, however, Lone Peak Parkway would also be over capacity in 2012 under the No Build Alternative. The 700 West corridor would still operate at acceptable traffic levels during peak hour conditions (LOS C) in 2012 under a worst case scenario for Alternative 4 (see Appendix A updates for more detail).

The traffic analysis results were used to evaluate air quality at both the 700 West and Lone Peak Parkway intersections and to model noise impacts between these two intersections along 11400 South. The air quality evaluation shows that there would not be any localized air quality violations under either scenario in 2012. It also shows that there would not be any receptors exceeding the noise abatement criteria under either scenario. The LOS at the 700 West intersection would be LOS A, which represents light traffic free-flow conditions with good maneuverability. The 700 West corridor would operate at LOS C during peak hour conditions, indicating stable traffic flow. As such, there would not be any traffic safety impacts expected with delaying the river crossing until 2012.

As discussed in Section 4.3.1 above, community cohesion along 11400 South would be adversely impacted by the new roadway as it would separate neighborhoods adjacent to the preserved corridor and alter adjoining neighborhoods along 11400 South that are primarily residential in character. However, these impacts to community cohesion would not be dependent on construction

phasing. They will occur at the time that the river crossing and new roadway is constructed regardless of when the I-15 interchange is completed.

In summary, if the interchange was constructed but the river crossing was not constructed until 2012 consistent with the LRP, there would be increased traffic levels, but 700 West would still operate at an acceptable LOS. Lone Peak Parkway would be over capacity under both Alternative 4 and the No Build Alternative. There would be no unacceptable air quality, noise, community cohesion, or safety concerns associated with this construction phasing scenario.

Alternative 7

The sequencing analysis for Alternative 7 shows that the 11400 south river crossing would need to be constructed first, in order to provide acceptable east-west mobility within the study area. Neither Jordan Gateway/Lone Peak Parkway or 10600 South would need to be widened until 2022 in order to continue to provide acceptable east-west mobility within the study area.

4.4 Direct and Indirect Economic Impacts

Economic impacts are discussed in terms of direct and indirect impacts. Direct impacts are such things as construction employment, relocations due to road widening and associated ROW acquisitions, and disruptions to business activities due to construction. Indirect impacts are related to induced growth: new development or business activity that might occur as a result of new or improved access or traffic flow in an area, or, conversely, a reduction in development or business activity due to impaired access or traffic flow. Indirect impacts are also tracked through related fiscal impacts to local governments. In addition to direct and indirect impacts, impacts due to a one-time influx of outside investment monies, or induced impacts, may occur. Induced impacts are estimated using an input-output economic model that estimates employment, income, and multiplier effects of this

outside investment. The following is a summary of a thorough economic analysis presented in Appendix F.

4.4.1 Direct Impacts

Direct impacts include employment opportunities during construction, construction expenditures, disruption during construction, and property acquisitions and relocations.

Employment Opportunities

Construction employment can be estimated from the estimated total project cost of each of the alternatives. Generally, 35 percent of the total construction value is for labor costs. For this study, the earliest preliminary project costs were used. It was also assumed that all wages would be paid to Salt Lake County workers. Table 4-5 compares the estimated construction employment among the five alternatives. In this analysis, it was assumed that \$1,000 of labor cost translates into roughly 11.6 hours of labor and that 1,880 hours equals one person-year of labor.

Construction Expenditures

Construction activity associated with the Build Alternatives would generate short-term expenditures by construction employees in the local area for items such as fast food, gasoline, and other convenience purchases. According the Utah State Tax Commission, the per capita sales average for construction workers in Utah is \$447.15, 20 percent of which is captured in the local market. Using the number of person-years employment, from Table 4-5, Table 4-6 compares the expected one-time revenues attributed to construction workers and realized in the local market among all five alternatives.

Potential economic impacts resulting from construction would consist of inconvenience to traveling motorists, restricted access to adjoining properties, and reduced sales and/or loss of business.

Inconvenience to traveling motorists would likely result in fewer vehicles traveling along roads undergoing construction as part of a

Build Alternative. Motorists, which are potential customers, may choose to avoid construction areas due to fears of traffic congestion, the confusion in traffic flow often caused by construction activities, and the feeling that businesses may be more difficult to access.

**Table 4-5.
Estimated Construction Employment**

	No Build Alt	Alt 1	Alt 3A	Alt 4	Alt 7
Total Project Cost (\$ millions)	0	208	167	122	150
Estimated Labor, Wages, Taxes, Benefits (\$ millions)	0	72.8	58.5	42.7	52.5
Estimated # of Person Years of Employment	0	450	361	264	324

**Table 4-6.
Estimated Worker Spending**

	No Build Alt	Alt 1	Alt 3A	Alt 4	Alt 7
Estimated # of Person Years of Employment	0	450	361	264	324
Estimated Amount Spent per Worker (\$)	447.15	447.15	447.15	447.15	447.15
Estimated Spending by Workers (\$)	0	201,218	161,421	118,048	144,877

Construction Disruption

Businesses rely on convenient access to attract customers. Alternate routes for accessing businesses during construction are typically inferior and likely confuse customers. Access to and from “mid-block” businesses that are not served by alternate access

routes would be restricted during construction activities. Business accesses that would be closed during construction activities related to any Build Alternative would reduce the number of customers of those particular businesses. The location of staging areas for construction equipment is also a primary concern of business owners: staging areas should be carefully located in order to minimize physical and visual access to businesses.

It is estimated that businesses along corridors undergoing construction may experience a 15 to 30 percent decline in sales while construction takes place, depending on the nature of the business, the length of time of construction, the length of time that the business has been in operation, the actual location of the business, alternative access routes to the business, etc. Generally, most businesses experience at least a ten percent reduction, while some have reported reductions of as high as 60 percent (see Appendix F, Economic Analysis Report).

Within the study area, most of the existing businesses that would be affected by a Build Alternative lie along 10400/10600 South or 12300/12600 South in either South Jordan or Riverton. Therefore, Alternatives 1 and 3A, which would disrupt businesses along the entire length of these two corridors, would have the greatest construction disruption impacts to businesses and South Jordan and Riverton would likely experience an associated loss of sales tax revenues. Due to concerns over privacy issues, data that would lead to estimates of lost business and sales tax revenues per alternative are not available. However, as is customarily the case, most lost sales would be made up elsewhere within the study area, as customers seek convenient places to shop close to home. Therefore, lost sales tax revenues for the cities may be recouped through an increase in sales tax revenues from other close-by businesses.

Relocations

There are up to 17 businesses (at 15 locations) that would potentially be relocated under Alternatives 1 and 3A, and two

businesses that would potentially be relocated under Alternative 7. These businesses are listed in Table 4-2. No businesses would be relocated under Alternative 4.

If the businesses Alternatives 1 and 3A are relocated outside of the study area, the study area would lose roughly \$5.7 million in annual gross sales, with an accompanying loss in annual local option tax revenues of around \$29,000 in each South Jordan and Riverton. If the businesses were to relocate within the study area, however, the lost sales would not be as great. Under Alternative 7, only two businesses would be relocated, resulting in a substantially lower loss in annual gross sales. There would be no loss in annual gross sales from business relocations as a result of implementing Alternative 4.

4.4.1.1 Mitigation Measures for Direct Impacts

To minimize lost sales due to construction activities, construction planning would include maintaining business access to business in construction areas. Construction signage indicating open business access points would be noticeably placed alongside the roadway. Traffic congestion due to construction activities would be minimized through traffic controls, such as warning signs and markers, detours, and flaggers to direct traffic through construction areas. Mitigation measures for business property acquisitions and relocations are discussed in Section 4.3.2.1.

4.4.2 Indirect Impacts

There is sufficient population at the present time to warrant an additional neighborhood scale retail development at 11400 South and Redwood Road, if access were to be improved as would occur under Alternatives 1, 4, and 7. Under the No Action Alternative and Alternative 3A, this demand would be met at community or regional scale developments along Bangerter Highway. A development of this kind would be roughly 10 acres in size, with roughly 50,000 square feet of retail space. This amount of space would produce about \$10 million in gross sales annually

and roughly \$100,000 in local option sales tax to South Jordan City.

The area near I-15 and 11400 South would be affected by increased demand for regional retail development. This is the only area within the study area that will gain from improved access with regional exposure, as opposed to local/neighborhood exposure, under any of the Build Alternatives.

Table 4-7 summarizes the projected commercial development scenarios for each alternative, based on the Economic Analysis (Appendix F) performed for this study based on discussions with city planners and analysis of land use plans, master plans, and economic development plans. While planned development would occur for all alternatives, the amount of retail space and the intensity of development differs for the various alternatives based on access along 11400 South and the amount of land available for development (as impacted by the amount of ROW needed for the various alternatives). Regional exposure equates to a level of development intensity that is expressed by a floor area ratio of 0.14; regional exposure and access equates to a higher development intensity that is expressed by a floor area ratio of 0.24.

As indicated in Table 4-7, Alternative 3A would not add any additional commercial development to the study area. This is because the roadway improvements for Alternative 3A occur along corridors that are already developed and no new accesses would be generated. Alternative 4, which includes a new interchange and improvements to 11400 South, provides the most new accesses and thus the most new commercial development. This alternative results in the most sales and local option sales taxes. Alternatives 1 and 7, while providing for new commercial accesses, lack a new interchange. This results in lower total sales and local option sales taxes than Alternative 4.

Impacts to office development are relatively minor. The only potential impact would be felt along the 10400/10600 South corridor in South Jordan over a period of one construction season (approximately 6 months).

The only traditional industrial development is located in Draper, just west of I-15 and south of 12300 South. This area is nearly completely developed, or soon to be completed. The current reconstruction for the 12300 South interchange will impact this industrial area and its distribution uses more than will any of the alternatives proposed in this study.

Table 4-7.
Impacts on Development, Amount of Sales, and
Sales Tax per Alternative

Area	No Build	Alt 1	Alt 3A	Alt 4	Alt 7
<i>Regional Commercial Acreage Development</i>					
NW of 11400 S and I-15	0	32	0	32	32
NE of 11400 S and I-15	0	29	0	25	29
SW of 11400 S and I-15	0	76	0	72	71
Total Comm. Development, Acres	0	137	0	129	132
<i>Ratio of Floor Area to Land Area in Square Feet</i>					
Floor Area Ratio	NA	0.14	NA	0.24	0.14
<i>Estimated Regional Retail Square Footage Development</i>					
Sq. Ft., South Jordan	0	200,000	-	332,000	200,000
Sq. Ft., Sandy	0	181,000	-	259,000	181,000
Sq. Ft., Draper	0	475,000	-	747,000	444,000
Total Regional Retail Sq. Ft.	0	856,000	-	1,338,000	825,000

Area	No Build	Alt 1	Alt 3A	Alt 4	Alt 7
<i>Projected Sales in Each City</i>					
Sales/Square Foot	\$350	\$350	\$350	\$350	\$350
South Jordan	\$0	\$70,000,000	\$0	\$116,200,000	\$70,000,000
Sandy	\$0	\$63,350,000	\$0	\$90,650,000	\$63,350,000
Draper	\$0	\$166,250,000	\$0	\$261,450,000	\$155,400,000
Total Projected Sales	\$0	\$299,600,000	\$0	\$468,300,000	\$288,750,000
<i>Projected Local Option Annual Sales Tax in Each City</i>					
South Jordan	\$0	\$700,000	\$0	\$1,162,000	\$700,000
Sandy	\$0	\$633,500	\$0	\$906,500	\$633,500
Draper	\$0	\$1,662,500	\$0	\$2,614,500	\$1,554,000
Total Projected Sales Tax	\$0	\$2,996,000	\$0	\$4,683,000	\$2,887,500

4.4.3 Net Present Value

As discussed in Section 4.3.5, *Construction Phasing*, construction of a Build Alternative depends on available funding and therefore all the elements of the selected alternative may not be constructed at one time. This section discusses economic benefit in terms of Net Present Value (NPV) associated with sequentially constructing the different components of each Build Alternative.

NPV is the current value of projected revenues to local jurisdictions, the study area, and the state of Utah that occur over time. A discount rate is used to reduce future benefits and costs to their present time equivalent (today's dollars). This allows one to compare alternatives with a single value that reflects both the

amount and timing of future benefits. The greater the NPV, the more value the alternative has in today's dollars to the various jurisdictions. Therefore, the greater the NPV the more economic benefit the alternative sequence has.

The NPV was calculated for each alternative. The approximate NPV for Alternative 1 is \$35 million if either the 11400 South river crossing is constructed first or if 10400/10600 South is widened first, provided the river crossing is constructed by 2012. For Alternative 3A, the NPV is \$3 million, whether 10400/10600 South or 12300/12600 South is widened first, provided both roadways are widened by 2012. For Alternative 4, the NPV is \$39 million if the river crossing is completed by 2012 and the interchange is completed by 2022 or \$50 million if the interchange and river crossing are both completed by 2012. For Alternative 7 the NPV is \$33 million provided the river crossing is constructed by 2012.

4.4.4 Induced Growth

Induced growth is calculated using the Utah Population, Economic and Demographic Model. This model measures the impact on the regional economy of new investment in the region. In this analysis, the new investment is assumed to be the federal portion of the total project costs (13 percent of total project costs, per UDOT). Induced growth does not include any of the direct or indirect impacts described above. Induced growth is the economic impact felt throughout all industries in the region by virtue of a general expansion of the economy based on a one-time infusion of additional capital into the area. The approximate induced growth according to the UPED Model for Alternative 1 is approximately \$14 million, for Alternative 3A: \$11 million; Alternative 4: \$9 million; and Alternative 7: \$10 million.

4.5 Recreational Impacts

This section discusses potential direct impacts to recreational resources within the study area. Recreational resources within the study area are shown on Figure 3-3 in Section 3.5. There would

be no significant indirect impacts to recreational resources from any of the Build Alternatives. Recreational resources that are considered Section 4(f) resources are discussed in more detail in Section 5, *Final Section 4(f) Evaluation*.

No Build Alternative

There would be no impacts to recreational facilities under the No Build Alternative. However, South Jordan may use its permit from the State Division of Forestry, Fire, and State Lands to construct a pedestrian bridge over the Jordan River near 11200 South.

The Jordan River is currently used on a limited basis by recreational boaters. Under the No Build Alternative, conditions for recreational boating would remain the same as at present.

Alternative 1

Direct

Under this alternative, approximately 1.25 acres of open space along the Jordan River Parkway would be converted to transportation related right-of way (0.22 acre at 12300 South, 0.88 acres at 11400 South, and 0.15 acre at 10600 South). The new and expanded river crossings would maintain the current parkway trail use by providing both pedestrian/equestrian and wildlife crossings under the roadway (see Figure 4-2).

The new roadway bridge and pedestrian/bicycle bridge would provide residents on the east side of the river with greater access to recreational facilities in place on the west side near 11400 South, such as the Midas Creek Fishing Ponds and River Front Park. Without the new bridge, residents on the east side of the river have to travel north to 10600 South or south to 12300 South to access these recreation areas.

The extension of 11400 South from 640 West to 1300 West would include sidewalks on both sides of the roadway. In addition, pedestrians, bicyclists, and equestrians using the parkway trail could cross the river over the adjacent pedestrian bridge that

would be constructed at a slightly lower level than the highway bridge. This pedestrian bridge would tie into the planned future segment of the Jordan River Parkway Trail on the west side of the river and the planned Draper City Trail on the east side of the river. Draper plans to construct a trail from 11400 South to the existing segment of the trail at approximately 12000 South. The trail may be constructed in 2004 or 2005.

Noise levels would increase for users of the Jordan River Parkway trail at all three river crossing locations. People using the trail are typically walking, jogging, bicycling, or rollerblading. The increase in noise levels experienced would be short in duration and localized, decreasing as one moved away from the roadway crossings. This noise increase would most likely not change the use of the trail.

The new roadway crossing at 11400 South would add an additional major man-made element to the viewshed of trail users. The quality of the scenery is presently somewhat diminished by residential development that has visually encroached into the river viewshed in some areas, on both the side hills and on the valley floor. These factors have already introduced discordant elements into the character of the landscape that results in only a moderate level of intactness of the overall visual resources of the Jordan River. The introduction of a new river crossing and road at 11400 South would further serve to diminish the quality of the scenery.

Recreational boaters using the Jordan River would have two expanded bridges to pass under and a new roadway/pedestrian bridge crossing at 11400 South. It is not expected that a change in use for recreational boating would occur along the Jordan River. Under this alternative, South Jordan would not construct a separate pedestrian bridge over the Jordan River, since the pedestrian bridge would be included as part of the highway bridge (see Section 4.5.2).

The Willow Creek West Park is planned at approximately 540 West and 11400 South. There would be no impact to this park,

since right-of-way has been preserved in this area by Draper for locating a detention basin and future road widening (see Section 4.5.2).

The new Jordan River Rotary Park at the Jordan River and 12300 South would be affected by this alternative, as approximately 0.3 acre of park would be converted to roadway right-of-way. Draper City has indicated that this widening would also create proximity impacts to some of the planned park facilities, including the proposed basketball court, equestrian trail, and picnic area (see Appendix D – September 8, 2004 letter from Draper City).

The new Riverton City Skate Park at 1450 West and 12600 South would also be affected by this alternative. According to Riverton City (see Appendix D – September 9, 2004 letter from Riverton City), the park was designed for more experienced skaters to use the north side of the park, where the bowls are located. Skaters will be skating out of the bowls at various speeds and at times directly towards the road. The road widening would reduce the planned safety buffer that was determined necessary at the beginning of the project.

The Galena Hills Community Park, planned for construction beginning 2005, will be located just south of 12300 South directly west of the UPRR tracks. Widening of 12300/12600 South would require widening the grade-separated crossing at the railroad tracks. A temporary railroad shoofly would be necessary during the bridge widening construction. A segment of the shoofly would require approximately 6 acres within the limits of the planned park. The impacts from the shoofly could exist for over a year.

Under Alternative 1, new east-west access would be provided for bicycles along 11400 South, since bicycle lanes would be constructed as part of the shoulder of the 11400 South extension. Existing and planned bicycle lanes along 12300/12600 South and 10400/10600 South would be maintained.

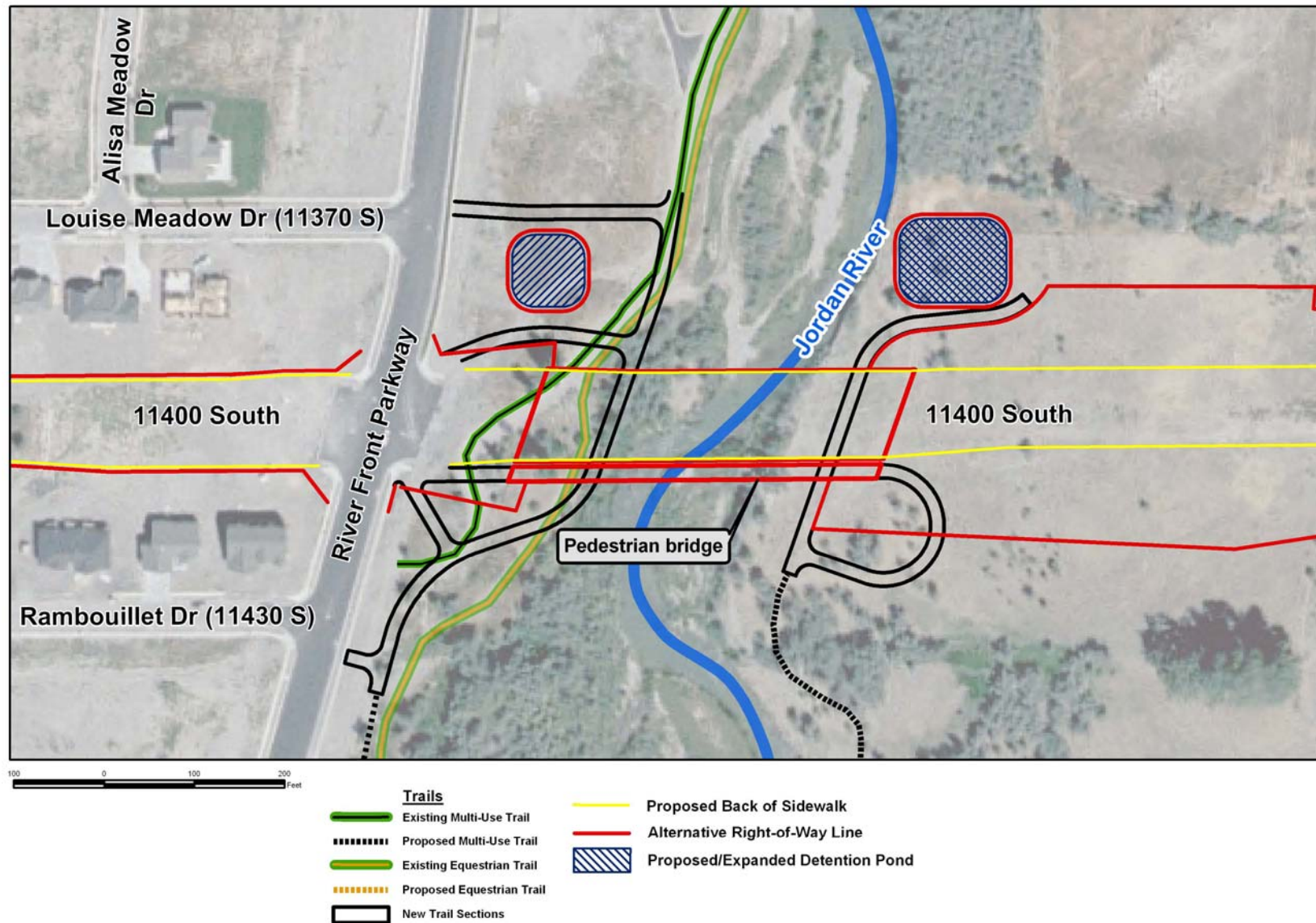


Figure 4-2. Conceptual Parkway Trail Connections at 11400 South

Alternative 3A

Under Alternative 3A, approximately 0.37 acres of open space along the Jordan River Parkway would be converted to transportation-related ROW (0.22 acre at 12300 South and 0.15 acre at 10600 South). As with Alternative 1, the expanded river crossings would maintain the current parkway trail use by providing both pedestrian/equestrian and wildlife crossings under the roadway. Noise levels on the Jordan River Parkway Trail may increase at 10600 South and 12300 South as they are widened. However, impacts from roadway noise in this area already exist.

Recreational boaters would cross under expanded bridge crossings at 12300 South and 10600 South. There would not be a new roadway bridge to pass under at 11400 South. However, South Jordan may use its permit from the DFFSL to construct a pedestrian bridge over the Jordan River near 11200 South. It is not expected that a change in use for recreational boating would occur along the Jordan River.

The new Jordan River Rotary Park at the Jordan River and 12300 South would be affected by this alternative. Approximately 0.3 acre of park would be converted to roadway right-of-way. This would also cause proximity impacts to some of the planned park facilities.

The new Riverton City Skate Park at 1450 West and 12600 South would also be affected by this alternative. The necessary safety buffer for skaters would be reduced as a result of the roadway widening.

Approximately 6 acres of the planned Galena Community Park would be used for a temporary railroad shoofly for at least a year.

Under Alternative 3A, bicycle lanes would be included in the widened 10400/10600 South and 12300/12600 South roadways. There would be no new bicycle lane facilities provided along 11400 South under this alternative.

Alternative 4

Under Alternative 4, approximately 1.03 acres (0.88 acres at 11400 South and 0.15 acre at 10600 South) would be converted to transportation-related ROW. The new and expanded river crossings would maintain the current parkway trail use by providing both pedestrian/equestrian and wildlife crossings under the roadway (see Figure 4-2).

The extension of 11400 South from 640 West to 1300 West would include sidewalks on both sides of the roadway. In addition, pedestrians, bicyclists, and equestrians using the parkway trail could cross the river over the adjacent pedestrian bridge that would be constructed at a slightly lower level than the highway bridge. This pedestrian bridge would tie into the planned future segment of the Jordan River Parkway Trail on the west side of the river and the planned Draper City Trail on the east side of the river. Draper plans to construct a trail from 11400 South to the existing segment of the trail at approximately 12000 South. The trail may be constructed in 2004 or 2005.

Noise levels would increase for users of the Jordan River Parkway trail at the 10600 South and 11400 South river crossing locations. People using the trail are typically walking, jogging, bicycling, or rollerblading. The increase in noise levels experienced would be short in duration and localized, decreasing as one moved away from the roadway crossings. This noise increase would most likely not change the use of the trail.

The new roadway crossing at 11400 South would add an additional major man-made element to the viewshed of trail users. The quality of the scenery is presently somewhat diminished by residential development that has visually encroached into the river viewshed in some areas, on both the side hills and on the valley floor. These factors have already introduced discordant elements into the character of the landscape that results in only a moderate level of intactness of the overall visual resources of the Jordan

River. The introduction of a new river crossing and road at 11400 South would further serve to diminish the quality of the scenery.

Recreational boaters using the Jordan River would have an expanded bridge to pass under and a new roadway/pedestrian bridge crossing at 11400 South. It is not expected that a change in use for recreational boating would occur along the Jordan River. Under this alternative, South Jordan would not construct a separate pedestrian bridge over the Jordan River, since the pedestrian bridge would be included as part of the highway bridge (see Section 4.5.2).

The Willow Creek West Park is planned at approximately 540 West and 11400 South. There would be no impact to this park, since right-of-way has been preserved in this area by Draper for locating a detention basin and future road widening (see Section 4.5.2).

New east-west access would be provided for bicycles along 11400 South, since bicycle lanes would be constructed as part of the shoulder of the 11400 South extension. Existing and planned bicycle lanes along 10600 South would be maintained.

Alternative 7

Alternative 7 would have the same impact to recreational resources as Alternative 4. Approximately 1.03 acres (0.88 acres at 11400 South and 0.15 acre at 10600 South) would be converted to transportation-related ROW. The new and expanded river crossings would maintain the current parkway trail use by providing both pedestrian/equestrian and wildlife crossings under the roadway (see Figure 4-2).

The extension of 11400 South from 640 West to 1300 West would include sidewalks on both sides of the roadway. In addition, pedestrians, bicyclists, and equestrians using the parkway trail could cross the river over the adjacent pedestrian bridge that would be constructed at a slightly lower level than the highway bridge. This pedestrian bridge would tie into the planned future

segment of the Jordan River Parkway Trail on the west side of the river and the planned Draper City Trail on the east side of the river. Draper plans to construct a trail from 11400 South to the existing segment of the trail at approximately 12000 South. The trail may be constructed in 2004 or 2005.

Noise levels would increase for users of the Jordan River Parkway trail at the 10600 South and 11400 South river crossing locations. People using the trail are typically walking, jogging, bicycling, or rollerblading. The increase in noise levels experienced would be short in duration and localized, decreasing as one moved away from the roadway crossings. This noise increase would most likely not change the use of the trail.

The new roadway crossing at 11400 South would add an additional major man-made element to the viewshed of trail users. The quality of the scenery is presently somewhat diminished by residential development that has visually encroached into the river viewshed in some areas, on both the side hills and on the valley floor. These factors have already introduced discordant elements into the character of the landscape that results in only a moderate level of intactness of the overall visual resources of the Jordan River. The introduction of a new river crossing and road at 11400 South would further serve to diminish the quality of the scenery.

Recreational boaters using the Jordan River would have an expanded bridge to pass under and a new roadway/pedestrian bridge crossing at 11400 South. It is not expected that a change in use for recreational boating would occur along the Jordan River. Under this alternative, South Jordan would not construct a separate pedestrian bridge over the Jordan River, since the pedestrian bridge would be included as part of the highway bridge (see Section 4.5.2).

The Willow Creek West Park is planned at approximately 540 West and 11400 South. There would be no impact to this park, since right-of-way has been preserved in this area by Draper for locating a detention basin and future road widening.

New east-west access would be provided for bicycles along 11400 South, since bicycle lanes would be constructed as part of the shoulder of the 11400 South extension. Existing and planned bicycle lanes along 10600 South would be maintained.

4.5.1 Mitigation Measures

Mitigation measures for Alternatives 1, 4, and 7 would include making the new roadway bridge at 11400 South a more natural color to fit into the surroundings, and providing a separate pedestrian/equestrian bridge that would be next to the roadway bridge to provide access to the parkway trails that are planned for both sides of the river. In addition, appropriate street lighting would be installed to reduce light impacts by directing light downward in the Jordan River Parkway area. The aesthetic treatments of the bridges at 10600 South and 12300 South would be re-evaluated for any bridge widening if there was community interest.

Under Alternatives 1 and 3A, mitigation measures for the Riverton Skate Park could include fencing along the north side of the park to address safety concerns.

4.5.2 Joint Development

Both South Jordan City and Draper City have coordinated with UDOT on the joint development of recreational facilities that would be constructed along 11400 South. These joint development activities, discussed below, apply to Alternatives 1, 4, and 7.

South Jordan had previously submitted an application to the Utah State Division of Parks and Recreation and the Utah Department of Forestry, Fire and State Lands (DFFSL) for the construction of a pedestrian/bicycle bridge over the Jordan River at approximately 11200 South. The intent of the bridge was to provide access to the Jordan River Parkway Trail for residents on both sides of the river. DFFSL issued a permit for the bridge in 2003.

Three of the four Build Alternatives (Alternatives 1, 4, and 7) include a new roadway bridge over the Jordan River at 11400 South. It was determined that a pedestrian/bicycle bridge could be constructed next to a roadway bridge crossing the river. In order to reduce the number of bridges crossing the Jordan River, the 11400 South project team asked South Jordan to put its plans for a pedestrian bridge over the Jordan River on hold. South Jordan City agreed to wait until a Preferred Alternative was selected for the 11400 South FEIS Project before proceeding with plans for its bridge. If a Build Alternative is selected that includes a new river crossing, then South Jordan would not build a separate pedestrian bridge at 11200 South. This would allow South Jordan to use the funds for a different project. If Alternative 3A is selected, which does not include a new crossing of the Jordan River, South Jordan would proceed with its plans to construct a pedestrian crossing.

Draper has been planning a small park, known as Willow Creek Park, on the west side of 11400 South just west of 540 West. The land planned for the park was previously private property until purchased by UDOT for the planned 11400 South roadway project after the 2000 EA was completed. Park planning was conducted jointly with UDOT and Draper City, in anticipation of the possible widening of 11400 South (see March 5, 2004 letter from Draper City in Appendix D). UDOT deeded 3.86 acres to Draper City, with the understanding that a detention basin would be constructed on the land to hold runoff water and groundwater associated with possible improvements to 11400 South. Draper agreed that part of the property would be deeded back to UDOT if 11400 South were widened. The remainder of the property, along with other property acquired by Draper, is planned as a linear parkway with a non-motorized trail. No park construction has begun yet.

4.5.3 Section 6(f) Properties

Section 6(f) properties are public recreational properties acquired or developed using funds from the Land and Water Conservation

Fund Act (LWCFA) of 1965. The LWCFA was enacted by Congress to provide money to federal, state, and local governments to purchase lands for maintaining or enhancing recreational opportunities, clean water, wildlife habitat, scenic resources, historic sites, and wilderness areas. Section 6(f) of this act provides special protection for property purchased or developed with LWCFA money, and prohibits the conversion of such lands to non-recreational purposes unless:

- The National Park Service has given approval, and
- The National Park Service has assured that replacement lands of equal value, location, and usefulness are provided to mitigate conversions of these lands for highway use.

According to the Grants Coordinator for the State Division of Parks and Recreation (see Appendix D – Bennett Contact Report, July 3, 2003), there are three Section 6(f) properties located within the 11400 South EIS study area:

- Crescent Park, 230 East 11000 South, Sandy
- Lone Peak Park, 10140 South 700 East, Sandy
- South Jordan City Park, 11000 South Redwood Road, South Jordan

None of these properties would be affected by any of the Build Alternatives. Therefore, there would be no use of Section 6(f) properties from the proposed action.

4.6 Air Quality Impacts

This analysis examined the direct impacts from air pollutants, particularly PM₁₀ and CO, on a project level for all alternatives.

There would be no significant indirect impacts to air quality as none of the alternatives would cause a violation of air quality standards and all the Build Alternatives would improve air quality slightly over the No Build Alternative. There may be additional fugitive dust caused by construction activities related to induced

growth and development, but these would be short term and dust control procedures would be required.

In addition to CO and PM₁₀, this section examines impacts from ozone, sulfur dioxide, nitrogen oxide, and lead. For each pollutant, the impacts were studied on a regional level examining the entire county and on a local level examining each major intersection along the affected corridors. The local level particulate matter discussion also includes requirements associated with dust control plans.

The highest levels of CO and PM₁₀, the air pollutants of most concern associated with a transportation project, typically occur along the Wasatch Front during the colder months of the year. PM₁₀ exceedances of the NAAQS traditionally occur when the air is stagnant, snow is on the ground, and temperatures are low. The cold winters, the surrounding mountains, and the proximity of the Great Salt Lake create ideal conditions for prolonged wintertime inversions in the area.

A summary of monitored pollutant concentrations relevant to transportation projects and closest to the proposed project area is shown below in Table 4-8. The Cottonwood and Herriman monitors are closest to the project area for the pertinent pollutants; although not every pollutant is monitored at every monitoring site. For example, the Herriman monitor does not measure CO or PM₁₀.

The Transportation Equity Act and the Clean Air Act require that transportation projects located within nonattainment or maintenance areas for one or more transportation-related pollutants (CO, PM, and O₃) demonstrate conformity between transportation plans and air quality plans (SIPs). A conforming transportation plan is one that has been analyzed for emissions of controlled air pollutants and found to satisfy the emission level limits established in the SIP (WFRC 2003a).

Table 4-8. Summary of Monitored Pollutant Concentrations for Salt Lake County*

Pollutant	Averaging Time	2002 Data	Standard	Station
CO	8-hour	3.8 ppm** (2001 data)	9 ppm	Cottonwood
	1-hour	5.6 ppm** (2001 data)	35 ppm	Cottonwood
Ozone	1-hour	0.117 ppm**	0.12	Herriman
	8-hour	0.083 ppm**	0.08	Herriman
PM ₁₀	Annual	32 µg/m ³	50 µg/m ³	Cottonwood
	24-hour	119 µg/m ³ **	150 µg/m ³	Cottonwood
PM _{2.5}	Annual	8.3 µg/m ³	15 µg/m ³	Herriman
	24-hour	59.7 µg/m ³	65 µg/m ³	Herriman

Source: (UDAQ, 2004a; 2004b, 2004c, 2004d)

Values reported for monitoring station closest to project site;

Cottonwood: 5715 South 1400 East; Herriman: 5600 West 12950 South

Reported value is highest recorded for year.

On January 20, 2004, FHWA made a conformity finding of the WFRC LRP and the 2004-2008 TIP. All of the projects listed under the No Build Alternative are included in the 2030 LRP (see Section 2.2.2 for the list of projects). A new interchange at I-15 and 11400 South and a new river crossing and widening of 11400 South from I-15 to Bangerter Highway are also included in the LRP. As all the regionally significant components of Alternative 4 are included in the LRP, Alternative 4 can be demonstrated to be in full compliance with the transportation conformity requirements. If an alternative other than Alternative 4 or the No Build Alternative is selected by FHWA, WFRC will be required to re-analyze the regional conformity analysis for both the LRP and the TIP to

include the selected alternative. Discussions have occurred between UDOT, WFRC, and FHWA to guarantee that all conformity requirements will be met prior to issuance of a Record of Decision.

Table 4-9 displays the emission impacts from each alternative based on 2030 vehicle miles traveled (VMT) for each alternative and grams per vehicle mile emission factors calculated using MOBILE6. The VMT and emission factors were developed by WFRC. The emissions shown in Table 4-9 demonstrate that the impacts from each alternative, including the No Build, are very similar. Emissions for each Build Alternative are lower than the emissions for the No Build Alternative. Air quality impacts would be essentially the same for all of the Alternatives as discussed below.

Table 4-9. 2030 Annual Emission Impacts by Alternative vs. Existing Emissions

		VOC Composite	CO Composite	NOx Composite	PM (exhaust)	PM (fugitive dust)
2004 E.F. (g/mile)		1.00	24.241	1.993	0.157	0.84
2030 E.F. (g/mile)		0.255	11.249	0.243	0.05	0.84
	VMT/yr by Alternative	(tons/yr)				
Existing 2004	42,628,450	46.99	1139.09	93.65	7.38	39.57
No Build	72,344,102	20.34	897.06	19.38	3.99	66.99
Alt 1	71,168,281	20.00	882.48	19.06	3.92	65.90
Alt 3A	71,172,803	20.01	882.54	19.06	3.92	65.90
Alt 4	71,259,517	20.03	883.62	19.09	3.93	65.98
Alt 7	71,143,746	20.00	882.18	19.06	3.92	65.88

Note: tons/yr = E.F.(g/mile)*VMT/yr/((453.59 g/lb)*(2000 lb/ton)); VMT data and 2030 E.F. from WFRC; 2004 E.F. based on current (2005) E.F. data from WFRC

4.6.1 Carbon Monoxide Analysis

Regional

This project is located in the cities of Draper, Riverton, Sandy, and South Jordan, all of which are considered attainment areas for CO. Therefore, further analysis at a regional level is not necessary. In addition, the regional CO impacts from an individual transportation project are likely to be small and uncertain.

Local

In addition to the regional conformity analysis, the Clean Air Act requires the preparation of a hot spot analysis of emissions for projects located within CO nonattainment areas. Although this project is not located in a CO nonattainment area, an air quality assessment, including a CO hot spot analysis, was performed to determine project level environmental impacts. For this project, the demonstration of acceptable CO concentrations at critical intersections is shown using traffic volume screening as determined in the *UDOT Air Quality Hot Spot Manual* (UDOT 2003b).

The purpose of the UDOT *Hot Spot Manual* is to provide guidance in using the transportation air quality dispersion (CAL3QHC) model to predict CO levels on roadway intersections in Utah. The manual included a “pre-screening” section to identify traffic volume thresholds where a project with traffic below the threshold volumes does not require detailed model runs but instead may use the model runs completed for the “pre-screened” intersections. The traffic volume thresholds for Salt Lake County are 25,000 vehicles per day for one lane of traffic and 45,000 vehicles per day for two or three lanes of traffic.

The traffic volumes used for this analysis were determined by the SYNCHRO traffic analysis model for the PM peak hour. The traffic volumes for critical intersections included in this FEIS have been pre-screened by the CAL3QHC model. Based on *Hot Spot Manual*

look-up tables, the traffic volumes associated with each alternative are not expected to cause the CO NAAQS to be violated.

In order to verify the “pre-screened” results in the Hot Spot Manual, the CAL3QHC model was run to examine CO concentrations for the intersection of 10600 South and I-15, which is a single point urban interchange (SPUI) with southbound and northbound off-ramps from I-15. The modeling results verify the “pre-screened” results that none of the alternatives should cause or contribute to any new CO violations (see Appendix G for hot spot analysis results).

The predicted peak hour daily traffic volumes (vehicles per hour [vph]) for critical intersections for each Build Alternative, and the No Build Alternative, are shown in Appendix G. The weekday average daily traffic (ADT) numbers are based on a 12 percent peak hour factor, as assumed in the *Hot Spot Manual*; therefore, the daily traffic counts shown in Appendix G may differ from ADT shown elsewhere within this report. The maximum intersection traffic volumes that do not require individual CAL3QHC modeling runs per the *Hot Spot Manual* are also shown for each intersection. Traffic volumes below the maximum weekday ADT would not be expected to cause a CO exceedance. All 2030 volumes are below the maximum weekday ADT as defined in the *Hot Spot Manual* and, therefore, do not require separate CAL3QHC modeling runs for each intersection.

Further analysis of the ADT numbers also indicate that modeling is not required for mainline traffic volumes within the study area. The same method used to pre-screen critical intersections also excludes further review of mainline traffic, which is below a maximum of 30,000 vehicles per day for one lane of traffic and 50,000 vehicles per day for two or three lanes of traffic. Therefore, mainline traffic within the study area would not be expected to cause the CO NAAQS to be violated.

Additionally, as shown in Table 4-9, the estimated CO emissions associated with Alternatives 1, 3A, 4, and 7 are each below the estimate for the No Build Alternative.

4.6.2 PM₁₀ Analysis

Regional

This project is located in Salt Lake County, a PM₁₀ nonattainment area. EPA approved the PM₁₀ SIP for Salt Lake County July 8, 1994. All projects included on the LRP and TIP must be in conformance with the SIP. All the projects identified as part of the No Build Alternative (see Section 2.2.2) are included the WFRC 2030 LRP and the TIP. There are also several additional projects within the study area that are on the LRP but are not part of the No Build Alternative. These additional projects are shown on Table 4-10. These projects comprise all the regionally significant elements of Alternative 4. Therefore, as stated previously, Alternative 4 can be demonstrated to be in full compliance with the transportation conformity requirements. If an alternative other than Alternative 4 or the No Build Alternative is selected by FHWA, WFRC will be required to re-analyze the regional conformity analysis for both the LRP and the TIP to include the selected alternative.

Table 4-10.
Additional Study Area Projects Included in the WFRC 2030 Long-Range Plan

Project	Description	LRP	TIP
11400 South from I-15 to 700 East	Widen from 2 to 4 lanes	X	
11400 South from I-15 to Redwood Rd.	Widen and construct across Jordan River; 4 lanes	X	
11400 South from Redwood Road to Bangerter Highway	Widen from 2 to 4 lanes	X	
11400 South and I-15	Interchange	X	X

Local

Transportation projects located within nonattainment area are required to prepare a PM₁₀ hot spot analysis of emissions. The analysis should demonstrate that the proposed project would not cause or contribute to any new localized PM₁₀ violations, or increase the frequency or severity of any existing violations. EPA has not yet released modeling guidance to perform a quantitative PM₁₀ hot spot analyses. Therefore, a PM₁₀ conformity demonstration must be based on a qualitative consideration of local factors.

Based on data contained on the Utah Division of Air Quality (UDAQ) Air Monitoring Center Web site, the Cottonwood PM₁₀ monitor last exceeded the 24-hour NAAQS in 1991 and the annual NAAQS in 1989. The last 24-hour NAAQS violation in Salt Lake County occurred in 1992. UDAQ is currently working on a new PM₁₀ SIP to possibly request from EPA redesignation of Salt Lake County to a maintenance area for PM₁₀.

Existing traffic volumes have not caused any PM₁₀ violations at the current Salt Lake County PM₁₀ monitors. All peak 2030 intersection forecasts (east/west vph plus north/south vph) are below the 2001 intersection counts at Bangerter Highway and 4700 South (8,600 vph) (12300 South EA 2001). All but five of the 2030 intersection forecasts (10600 South & Jordan Parkway- Alternative 1, 10600 South & State Street- Alternatives 1, 3, 4, & 7), not including the No Build Alternative, are also below 2001 counts for Bangerter Highway and 5400 South (7,700 vph) (12300 South EA, 2001). Bangerter Highway, between 4700 South and 5400 South, has not had any PM₁₀ violations; it should be noted, however, that a monitor is not located near these intersections.

All 2030 traffic forecasts, excluding 10600 South, are below 2020 estimated intersection counts for State Street and 12300 South (7,100 vph) (12300 South EA 2001). The 2020 traffic volume estimates at State Street and 12300 South were not expected to

cause a PM₁₀ hotspot problem, as outlined in the 12300 South EA. Contributions to PM₁₀ include combustion of solid fuels such as wood and coal, agricultural activities such as fertilization and grain storage, construction activities, and dust from gravel and unpaved roadways. Transportation-related sources of PM₁₀ include motor vehicle exhaust, dust from paved and unpaved roads, road sanding, salting and sweeping activities, and brake wear.

Based on surrounding land uses, and the dust abatement programs that are required during construction activities, and due to the recent and expected maintenance of PM₁₀ concentrations below the PM₁₀ NAAQS at Salt Lake County air monitors, the proposed alternatives are not likely to trigger any new violations of the PM₁₀ NAAQS. The Utah Air Quality Rules require a dust control plan from all sources whose activities or equipment have the potential to produce fugitive dust or airborne dust along the Wasatch Front, including roadway construction activities. Dust control plans, as outlined in UAC R307-309, are required to minimize fugitive dust onsite from pits, yards, storage areas, and areas of operation and to prevent greater than 10 percent opacity from fugitive dust at the property boundary. The fugitive dust rule, UAC R307-309, addresses storage and handling of aggregate materials, construction/demolition activities on greater than 0.25 acre, roadways, mining activities, and tailings piles and ponds (UDAQ 1999). A plan must be submitted to UDAQ no later than 30 days after the source becomes subject to the rule (UDAQ 2002). A dust control plan would be needed for the construction phase of any of the Build Alternatives.

As described in 40 CFR 93.105, consultation with a State or local agency is required as part of a PM₁₀ qualitative analysis. The Utah Division of Air Quality was consulted as part of this analysis. The State has agreed with the above evaluation and conclusions.

Additionally, as shown in Table 4-9, the estimated PM emissions associated with Alternatives 1, 3A, 4, and 7 are each below the estimate for the No Build Alternative.

4.6.3 Ozone Analysis

Regional

The Build Alternatives are all located in Salt Lake County, which is a maintenance area for ozone. EPA approved the ozone maintenance plan on February 2, 1997. As previously noted, the projects shown in Table 4-10 are included in the WFRC Long-Range Transportation Plan Update 2004-2030 (WFRC 2003b) or the WFRC 2004-2008 TIP (WFRC 2003c). Inclusion of a project in a conforming LRP and a conforming TIP is required for the project's regional conformity analysis.

As stated previously, all the regionally significant components of Alternative 4 are included in the LRP. Therefore, Alternative 4 can be demonstrated to be in full compliance with the transportation conformity requirements. If an alternative other than Alternative 4 or the No Build Alternative is selected by FHWA, WFRC will be required to re-analyze the regional conformity analysis for both the LRP and the TIP to include the selected alternative. Discussions have occurred between UDOT, WFRC, and FHWA to guarantee that all conformity requirements will be met prior to issuance of a Record of Decision.

Local

Ozone is a regional pollutant and cannot be analyzed on a project level. Therefore, a localized analysis of the Build Alternatives for ozone impacts is not necessary. As all of the Build Alternatives would reduce traffic congestion and delay, the project may actually improve the region's ozone air quality problems. Project-level improvements, however, would most likely have negligible impacts.

Additionally, as shown in Table 4-9, the estimated VOC and NO_x (ozone precursors) emissions associated with Alternatives 1, 3A, 4, and 7 are each below the estimate for the No Build Alternative.

4.6.4 Sulfur Dioxide, Nitrogen Oxide, and Lead Analysis

Salt Lake County is a nonattainment area for SO₂. EPA approved the SO₂ SIP in 1994. Salt Lake County is an attainment area for both NO₂ and lead. Because these three pollutants are also regional pollutants, it is difficult to analyze them on a project level. In addition, emissions of SO₂, NO₂, and lead from motor vehicles are typically low. Consequently, any impacts from these pollutants associated with the Build Alternatives would most likely be negligible.

4.6.5 Mobile Source Air Toxics

Project Level MSAT Discussion

The analysis of air toxics is an emerging field. The U.S. Department of Transportation (DOT) and EPA are currently working to develop and evaluate the technical tools necessary to perform air toxics analysis, including improvements to emissions models and air quality dispersion models. Limitations with the existing modeling tools preclude performing the same level of analysis that is typically performed for other pollutants, such as carbon monoxide. FHWA's ongoing work in air toxics includes a research program to determine and quantify the contribution of mobile sources to air toxic emissions, the establishment of policies for addressing air toxics in environmental reports, and the assessment of scientific literature on health impacts associated with motor vehicle toxic emissions.

Even though reliable quantitative methods do not exist to accurately estimate the health impacts of MSATs as noted in Chapter 3, it is possible to qualitatively assess future MSAT emissions under the project alternatives. Based on this approach, it is likely that any of the Build Alternatives will result in lower MSAT emissions over the No Build case and that future emissions under both the Build and No Build scenarios will be lower than present day emissions.

For each alternative in this EIS, the amount of MSATs emitted would be proportional to the vehicle miles traveled, or VMT, assuming that other variables such as fleet mix are the same for each alternative. Because the VMT estimated for the No Build Alternative is higher than for any of the Build Alternatives, increased impacts to regional air quality related to MSATs are not expected from any of the Build Alternatives. See Table 4-9. In addition, because the estimated VMT under each of the Build Alternatives are nearly the same, varying by less than two tenths of one percent, it is expected there would be no appreciable difference in overall MSAT emissions among the various alternatives. Also, regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce MSAT emissions by 67 to 90 percent. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA projected reductions are so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future as well.

Because of the specific characteristics of the project alternatives (i.e. new connector roadways), under each alternative there may be localized areas where VMT would increase, and other areas where VMT would decrease. Therefore it is possible that localized increases and decreases in MSAT emissions may occur. The localized increases in MSAT emissions would likely be most pronounced along the new roadway sections that would be built at 11400 South, between 700 West and 1300 West, under Alternatives 1, 4 and 7, and along 11000 South and 11800 South under Alternatives 1 and 3a. However, as discussed above, the magnitude and the duration of these potential increases cannot be accurately quantified because research is still being conducted on health effects and modeling techniques. Further, even if these increases do occur, they too will be substantially reduced in the

future due to implementation of EPA's vehicle and fuel regulations.

In sum, under all Build Alternatives in the design year it is expected there would be reduced MSAT emissions in the study area, relative to the No Build Alternative, due to reduced VMT and due to EPA's MSAT reduction programs. There could be slightly elevated but unquantifiable increases in MSATs to residents and others in a few localized areas where VMT increase, which may be important particularly to any members of sensitive populations. However, there will likely be decreases in MSAT emissions in locations where VMT are reduced. In general, MSAT levels are likely to decrease over time due to nationally-mandated cleaner vehicles and fuels.

Unavailable Information for Project Specific MSAT Impact Analysis

The science and modeling of project specific MSAT impacts has not developed to the point where there is certainty or scientific community acceptance. Accordingly, information on MSAT impacts on any of the alternatives in this FEIS is not available, and the means to obtain this information have not been fully developed. When this is the case, 40 CFR 1502.22(b) requires FHWA to address four provisions: 1) A statement that such information is incomplete or unavailable; 2) A statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment; 3) A summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment; and 4) The agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community.

1. Project specific MSAT analysis is an emerging field and the science has not been fully developed. FHWA is aware

that MSAT releases to the environment may cause some level of pollution. What is not scientifically definable is an accurate level of human health or environmental impacts that will result from the construction of new transportation facilities or modification of existing facilities. Project-level MSAT risk assessment involves four major steps: emissions modeling, dispersion modeling in order to estimate ambient concentrations resulting from the estimated emissions, exposure modeling in order to estimate human exposure to the estimated concentrations, and then final determination of health impacts based on the estimated exposure. Each of these steps is currently encumbered by technical shortcomings that prevent a formal determination of the MSAT impacts of this project. The emissions model (MOBILE6.2) is based on limited data raising concerns over the accuracy of the final estimates. Further the particulate emissions rates from MOBILE6.2 are not sensitive to vehicle speed, which is an important determinant of emissions rates (this is a shortcoming for diesel particulate matter, but not the remaining priority MSATs) or acceleration. Given uncertainties in the emissions estimation process, subsequent calculated concentrations would be equally uncertain. But beyond this, the available dispersion models have not been successfully validated for estimating ambient concentrations of particulate matter or reactive organic MSATs. Available exposure models are not well designed to simulate roadside environments. Finally, the toxicity value of at least one of the priority MSATs, that of diesel particulate matter, has not been nationally established, which would prevent the determination of health impacts of this pollutant even if the other necessary tools were available. Thus, current scientific techniques, tools, and data make it impossible to accurately estimate

actual human health or environmental impacts from MSATs that would result from a transportation project.

2. Without this project specific MSATs analysis, it is impossible to quantitatively evaluate the air toxic impacts at the project level. Therefore, this unavailable or incomplete information is very relevant to understanding the "significant adverse impacts on the human environment," since the significance of the likely MSAT levels cannot be assessed.
3. Research into the health impacts of MSATs is ongoing. For different emission types, there are a variety of studies that show that some either are statistically associated with negative health outcomes through epidemiological studies (frequently based on emissions levels found in occupational settings) or that animals demonstrate negative health outcomes when exposed to large doses. There have been other studies and papers that suggest MSATs have health impacts. However, noting that unresolved issues still remain, the Health Effects Institute, a non-profit organization jointly funded by EPA and industry, has undertaken a major series of studies to determine whether MSAT hot spots exist and what the health implications are if they do. The final summary of these studies is not expected to be completed for several more years.

Several recent studies have been reported to show that close proximity to roadways is related to negative health outcomes, particularly respiratory problems¹¹. Yet these

¹¹ South Coast Air Quality Management District, Multiple Air Toxic Exposure Study-II (2000); Highway Health Hazards, The Sierra Club (2004) summarizing 24 Studies on the relationship between health and air quality); NEPA's Uncertainty in the Federal Legal Scheme Controlling Air Pollution from Motor Vehicles, Environmental Law Institute, 35 ELR 10273 (2005) with health studies cited therein.

studies are often not specific to MSATs. Instead they have encompassed the full spectrum of both criteria pollutants and other pollutants. Thus it is impossible to determine whether MSATs are responsible for the health outcomes or the criteria pollutants.

There is also considerable literature on the uncertainties associated with the emissions modeling process. The most significant of these is an assessment conducted by the National Research Council of the National Academy of Sciences, entitled "Modeling Mobile-Source Emissions" (2000). This review noted numerous problems associated with then current models, including the predecessor to the current MOBILE 6.2 model. The review found that, "significant resources will be needed to improve mobile source emissions modeling." The improvements cited include model evaluation and validation, and uncertainty analysis to raise confidence in the model's output. While the release of MOBILE 6.2 represents an improvement over its predecessor, the MSAT emission factors have not been fully validated due to limits on dispersion modeling and monitoring data. The MOBILE 6.2 model is currently being updated and its results will not be evaluated and validated for several years.

4. Even though there is no accepted model or accepted science for determining the impacts of project specific MSATs, as noted above, EPA predicts that its national control programs will result in meaningful future reductions in MSAT emissions, as measured on both a per vehicle mile and total fleet basis. FHWA believes that these projections are credible, because the control programs are required by statute and regulation. Also, since all of the Build Alternatives result in reduced VMT in the project area relative to the No Build Alternative, FHWA is confident that MSAT emissions will also be lower in the project area in

the design year under those alternatives. As this project involves new connector roadways, there could be slightly elevated but unquantifiable increases in MSATs to residents and others in a few localized areas where VMT increase, which may be important particularly to any members of sensitive populations. However, there will likely be decreases in MSAT emissions in locations where VMT are reduced. Because MSAT emissions on a per VMT basis are expected to decline due to EPA's control program, and because each of the Build Alternatives would result in a nearly equal reduction in VMT relative to the No Build Alternative, FHWA does not believe that there will be significant adverse impacts on the human environment.

4.6.6 Mitigation Measures

Mitigation measures would include developing and implementing a dust control plan for all construction activities and monitoring opacity during construction. In addition, to minimize exhaust emissions during construction, contractors may be required to use emission control devices and limit unnecessary idling of construction equipment.

4.7 Direct and Indirect Noise Impacts

Existing noise levels were characterized and future 2030 noise levels were modeled to determine possible traffic noise impacts associated with the different alternatives. In addition, potential noise abatement strategies were considered for mitigating roadway noise impacts. This process was completed according to state and federal noise policies and regulations. Noise impacts were calculated using the FHWA Traffic Noise Model (TNM) Version 2.5 computer program for receiver locations along the affected routes of each alternative. The complete noise report is included in Appendix H.

All sound level measurements and estimates in this document are reported as Leq(h) in units of decibels (dB) and are A-weighted.

The Leq describes the receiver's average noise exposure from all events over a given period of time. Leq(h) is the hourly value of Leq. The "A" indicates that the sound has been filtered to reduce the strength of very low and very high frequency sounds, much as the human ear would hear. On the average, each A-weighted sound level increase of 10 dB corresponds to an approximate doubling of subjective loudness. Table 4-11 summarizes the audible differences perceived by most people associated with changes in decibel levels (UDOT, 2004).

Future 2030 noise model runs for Alternatives 1, 3A, 4 and 7, and the No Build Alternative were based on the existing model set up. For Alternatives 1, 3A, 4 and 7, the existing model was modified based on roadway improvements and future traffic data for the worst hourly traffic noise conditions. Traffic volumes were different for each alternative requiring model runs for each scenario. The No Build Alternative model run used the existing roadway configuration and 2030 traffic data for the worst hourly traffic noise conditions. Receivers were primarily placed near buildings or outside residential areas such as backyards and patios where residents may be exposed to traffic noise.

Table 4-11.
Decibel Increase vs. Audible Difference

Decibel Increase	Audible Difference
1 dBA	No perceptible change
3 dBA	Barely perceptible change
5 dBA	Readily perceptible change
10 dBA	Perceived as twice as loud

Source: UDOT, 2004

Direct

Table 4-12 summarizes the number of impacted noise receptor dwellings by Alternative. For example, under the No Build Alternative, along 10400/10600 South, out of the 131 potential receptor dwellings evaluated, 66 receivers would experience noise

levels below 65 dBA (Category B) or 70 dBA (Category C) and 65 receivers would experience noise levels equal to or exceeding 65 dBA (Category B) or 70 dBA (Category C). The total number of receptor dwellings that would experience noise levels at or over the NAC, and the number of receptors that could achieve a 5 dBA or greater noise reduction with the use of noise barriers are also indicated. Houses that would be relocated under any of the build alternatives were not included as potential receptors.

The total number of receptors over the NAC of 65 dBA or 70 dBA shown in Table 4-12 appear to be greatest for Alternatives 1, 4 and 7 as a result of the roadway modifications proposed for 11400 South under these alternatives. These alternatives propose widening 11400 South and adding a new roadway between River Front Parkway and 1300 West that does not currently exist. As a result, receptors along 11400 South that are not currently impacted by traffic noise show noise level increases greater than 10 dBA or 2030 noise levels greater than the NAC under Alternatives 1, 4 and 7. Many of the receptors along 12300/12600 South and 10400/10600 South are over 65 dBA regardless of the Alternative, including the No Build Alternative. A full copy of the noise analysis report is included in Appendix H. Both the 65 dBA and 70 dBA noise contours are shown in the Appendix H figures for each of the Build Alternatives, as well as the No Build Alternative.

Indirect

Indirect noise impacts may include increased noise levels associated with increased residential and commercial development resulting from any of the Build Alternatives. These impacts are not quantifiable but can reasonably be expected to occur.

4.7.1 Mitigation Measures

Many of the receivers predicted to experience a noise impact within the study area have direct access via driveways to the

affected corridor. Gaps in noise walls caused by driveways negate a wall's effectiveness to reduce noise. Therefore, areas with direct access cannot be mitigated with noise barriers. Such locations were not considered feasible or reasonable due to safety concerns and were not analyzed for noise barriers. Other areas that would result in short-term impacts, such as the Jordan River Parkway Trail, were not considered for noise barriers because potential receivers, such as walkers, joggers, or bicyclists, move toward the increased noise levels and then move quickly away, as the trail is perpendicular to 10600 South, 11400 South, and 12300 South. Commercial receivers and receivers such as hotels and schools were modeled for noise levels but they were not considered for noise barriers as these receivers typically desire highly visible locations and the majority of frequent human activity at these locations occurs inside the buildings. Churches were also modeled for noise impacts. All churches along the affected corridors have direct access via driveways to the corridors and therefore noise barriers were not appropriate at these locations due to safety concerns. The UDOT Noise Abatement Policy (UDOT, 2004) states that noise abatement will only be considered if the proposed noise barrier would achieve a minimum 5 dBA noise reduction and the cost would not exceed \$25,000 per benefited receiver. In addition, noise abatement will only be considered if the combination of 75 percent of the impacted front row receivers and 67 percent overall (including front row receivers) of the impacted residents who receive a minimum of 5 dBA reduction vote, through balloting, in favor of the abatement. Balloting of affected residents will be conducted prior to the final environmental document approval (the ROD).

Noise barriers were analyzed in various locations along 10400 South, 11400 South, and 12300 South. If a receiver was located along a corridor that will not be modified by an alternative, such as the western portion of 10400 South under Alternative 4, that receiver was not analyzed for a noise barrier under that particular alternative. The Traffic Noise Model Version 2.5 was used to

estimate the effectiveness of noise barriers at these locations. When necessary, additional receivers were inserted adjacent to proposed barriers to improve the analysis and associated calculations.

Twenty-five potential noise barriers were analyzed at residential locations to determine the physical feasibility and the economical reasonableness of the barriers. Sixteen barriers meet the UDOT criteria of both a 5dBA or more noise reduction and \$25,000 per benefited residence. The residential locations where a continuous barrier could be constructed for the benefit of individual or multiple dwelling units were as follows:

- The northeast corner residence at 10391 South 3200 West;
- The northwest corner residence at 10378 South 2700 West;
- The north side of 10400 South at approximately 2600 West;
- The south side of 10400 South at approximately 2500 West;
- The south side of 10400 South at approximately 2300 West;
- The north side of 10400 South at approximately 2200 West;

- The south side of 10400 South between Gladys Dr. (1925 West) and Culmination St. (2010 West);
- The south side of 10400 South between the Utah/Salt Lake Canal and Gladys Dr. (1925 West);
- The north and south sides of 11400 South between 1300 West and River Front Parkway (900 West);
- The south side of 12600 South at approximately 3150 West;
- The north side of 12300 South at approximately 940 West;
- The north side of 12300 South at approximately 800 West;and
- The southwest corner residence at Lone Peak Parkway and Election Rd. (11895 S.).

Proposed noise barrier locations, by alternative, are summarized in Table 4-13 and shown on Figures 4-3a through 4-3d. Typically, noise wall heights as seen by the affected residents would range from 6 to twelve feet. Noise impacts by alternative are discussed following Table 4-13.

**Table 4-12.
Number of Impacted Receivers per Alternative**

Corridor	Impact										
	Total # of receptor dwellings	No Build		Alternative 1		Alternative 3A		Alternative 4		Alternative 7	
		<NAC	≥NAC	<NAC	≥NAC	<NAC	≥NAC	<NAC	≥NAC	<NAC	≥NAC
10400/10600 South	131	66	65	51	80	54	77	61	70	62	69
11400 South	175	156	19	83	92*	152	23	67	108*	65	110*
12300/12600 South	131	73	58	50	81	55	76	60	71	60	71
Jordan Gateway/ Lone Peak Parkway	18	14	4	15	3	15	3	15	3	17	1
State Street	7	6	1	6	1	6	1	5	2	6	1
700 West Near 11400 South	6	5	1	5	1	5	1	5	1	5	1
Total # of receptor dwellings ≥NAC*			148		258		181		255		253
# of receptor dwellings that could achieve 5 dBA or greater mitigation			0		72		27		29		39

NAC: Noise Abatement Criteria; * Includes substantial noise increases of 10 dBA or more.

**Table 4-13.
Potential Noise Barriers**

Barrier Location	Applicable Alternatives	Number of Benefited Residences	Noise Reduction Range Per Benefited Residence (dBA)	Maximum Barrier Height (ft)	Barrier Length (ft)	Barrier Area (ft²)	Barrier Cost ^a (\$)	Cost Per Benefited Residence ^b (\$)	Criteria Met?^c Yes or No
10430 S. 3200 W. (SW Corner Lot)	1,3A	0/0	3.1/3.1	12	222	2,264	\$22,640	n/b	No
10391 S. 3200 W. (NE Corner Lot)	1,3A	1/1	5.5/5.4	9	146	1,314	\$13,140	\$13,140	Yes
10381 S. 2840 W. (NE Corner Lot)	1,3A	0/0	3.6/2.8	12	120	1,440	\$14,400	n/b	No
10378 S. 2700 W. (NW Corner Lot)	1,3A	1/1	5.1/5.2	8.5	76	646	\$6,460	\$6,460	Yes
North Side of 10400 S. at approximately 2600 West	1,3A	8/8	6.6-9.3/6.9-9.0	6	928	5,564	\$55,640	\$6,955	Yes
South Side of 10400 S. at approximately 2500 West	1,3A	5/5	5.0-7.3/5.4-6.3	6	514	3,084	\$30,840	\$6,168	Yes
South Side of 10400 S. at approximately 2300 West	1	4	5.0-5.6	10	533	5,330	\$53,300	\$13,325	Yes
North Side of 10400 S. at approximately 2200 West	1,3A	2	5.5/5.4	6.5	327	2,126	\$21,260	\$10,630	Yes
Approximately 10430 S. Culmination Dr. (2010 W.)	1	0	3.0	12	117	1,404	\$14,040	n/b	No
South Side of 10400 S. between Gladys Dr. (1925 W.) and Culmination St. (2010 W.)	1	3	4.2-5.9/	8	436	3,488	\$34,880	\$11,627	Yes
South Side of 10400 S. between Salt Lake Canal and Gladys Dr. (1925 W.)	7	4	2.9-6.2	8	843	6,744	\$67,440	\$16,860	Yes
South Side of 10400 S. at approximately 1547 West	1,3A,7	0/0/0	1.6-2.8/2.2-4.0/1.6-3.8	12	138	1,656	\$16,560	n/b	No

**Table 4-13. (cont.)
Potential Noise Barriers**

Barrier Location	Applicable Alternatives	Number of Benefited Residences	Noise Reduction Range Per Benefited Residence (dBA)	Maximum Barrier Height (ft)	Barrier Length (ft)	Barrier Area (ft ²)	Barrier Cost ^a (\$)	Cost Per Benefited Residence ^b (\$)	Criteria Met? ^c Yes or No
Northeast Corner of 11400 South and 445 West	4	0	4.0	12	98	1,176	\$11,670	n/b	No
North Side of 11400 S. at approximately 800 West	1,4,7	0/na/na	0.7-3.0 /0.7-3.1/0.7-3.0	12	520	6,240	\$62,400	n/b	No
North Side of 11400 S. between River Front Parkway (900 West) and Chapel View Dr.(1060 West)	1	10	5.4-11.3	10		9,710	\$97,100	\$9,710	Yes
	4	5	3.7-7.2	12		11,658	\$116,580	\$23,316	Yes
	7	10	5.5-11.4	10	971	9,710	\$97,100	\$9,710	Yes
South Side of 11400 S. between River Front Parkway and Chapel View Dr.	1	9	5.2-6.9	12		11,580	\$115,800	\$12,867	Yes
	4	4	4.3-7.2	12		11,580	\$115,800	\$28,950	No
	7	9	5.8-9.2	8	965	7,720	\$77,200	\$8,578	Yes
North Side of 11400 S. between Chapel View Dr. and Palisade Rim Dr.(1162 West)	1	12	5.0-10.3	8 ^d		9,471	\$94,710	\$7,893	Yes
	4	9	4.1-9.8	8 ^d		9,471	\$94,710	\$10,523	Yes
	7	9	3.9-10.0	8 ^d	1,127	9,471	\$94,710	\$10,523	Yes
South Side of 11400 S. between Chapel View Dr. and Palisade Rim Dr.	1	8	4.0-10.3	12 ^d		10,046	\$100,460	\$12,558	Yes
	4	11	5.1-9.1	12 ^d		10,046	\$100,460	\$12,558	Yes
	7	11	5.1-10.0	12 ^d	1,126	9,358	\$93,580	\$8,507	Yes
North Side of 11400 S. between Palisade Rim Dr. and 1300 West	1,4,7	1/1/1	3.7-5.2/3.6-5.1/ 3.6-5.2	12	741	8,892	\$88,920	\$88,920	No
South Side of 11400 S. between Palisade Rim Dr. and 1300 West	1,4,7	0/0/0	2.5-3.9/2.3-3.8/ 2.2-3.9	12	735	8,820	\$88,220	n/b	No
South Side of 12600 S. Approximately 3150 West	1,3A	6/4	5-6.1/4.8-6.0	8	628	4,400	\$44,000	\$7,333 \$11,000	Yes

**Table 4-13. (cont.)
Potential Noise Barriers**

Barrier Location	Applicable Alternatives	Number of Benefited Residences	Noise Reduction Range Per Benefited Residence (dBA)	Maximum Barrier Height (ft)	Barrier Length (ft)	Barrier Area (ft²)	Barrier Cost ^a (\$)	Cost Per Benefited Residence ^b (\$)	Criteria Met? ^c Yes or No
Approximately 12594 S. 1540 W. (NE Corner Lot)	1,3A	0/0	2.3/2.2	12	81	972	\$9,720	n/b	No
North Side of 12300 S. at approximately 940 West	1,3A	4/4	3.6-5.7/3.7-5.8	6	541	3,247	\$32,470	\$8,118	Yes
North Side of 12300 S. at approximately 800 West	1,3A	4/4	5.1-8.4/5.0-8.5	8	469	3,754	\$37,540	\$9,385	Yes
Northwest Corner of Lone Peak Parkway and Inauguration Rd. (11815 S.)	3A	0	1.0-2.6	12	164	1,968	\$19,680	n/b	No
Southwest Corner of Lone Peak Parkway and Election Rd. (11895 S.)	3A	1	5.6	12	197	2,364	\$23,640	\$23,640	Yes

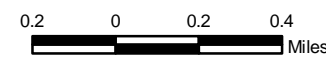
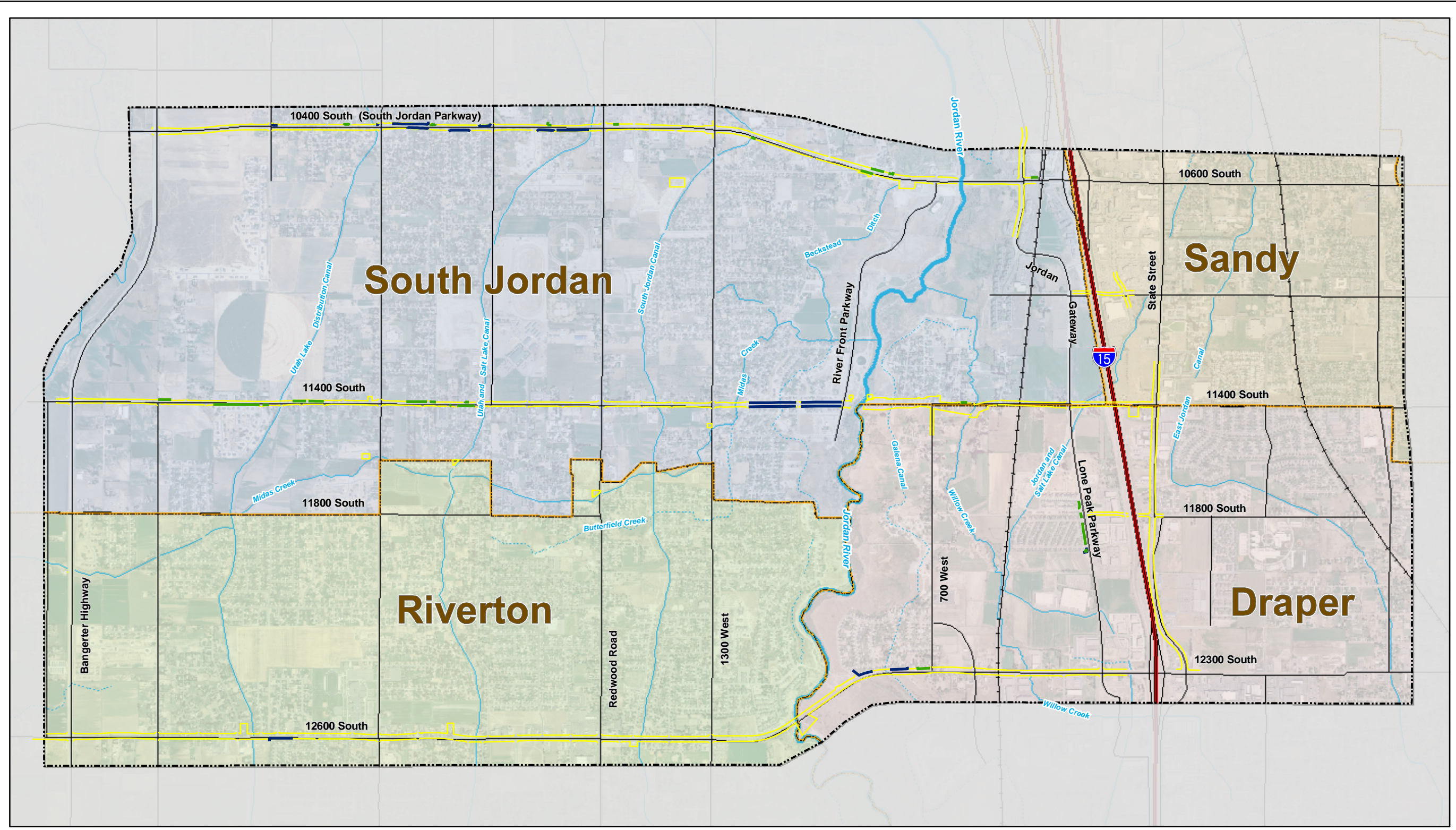
a Assumes cost of \$10/ft² based on average UDOT bid prices for 2001 - 2004.

b Costs may change due to final design considerations.

c If no, does not meet noise reduction requirements of greater than or equal to 5 dBA and/or exceeds cost per benefited residence of \$25,000.

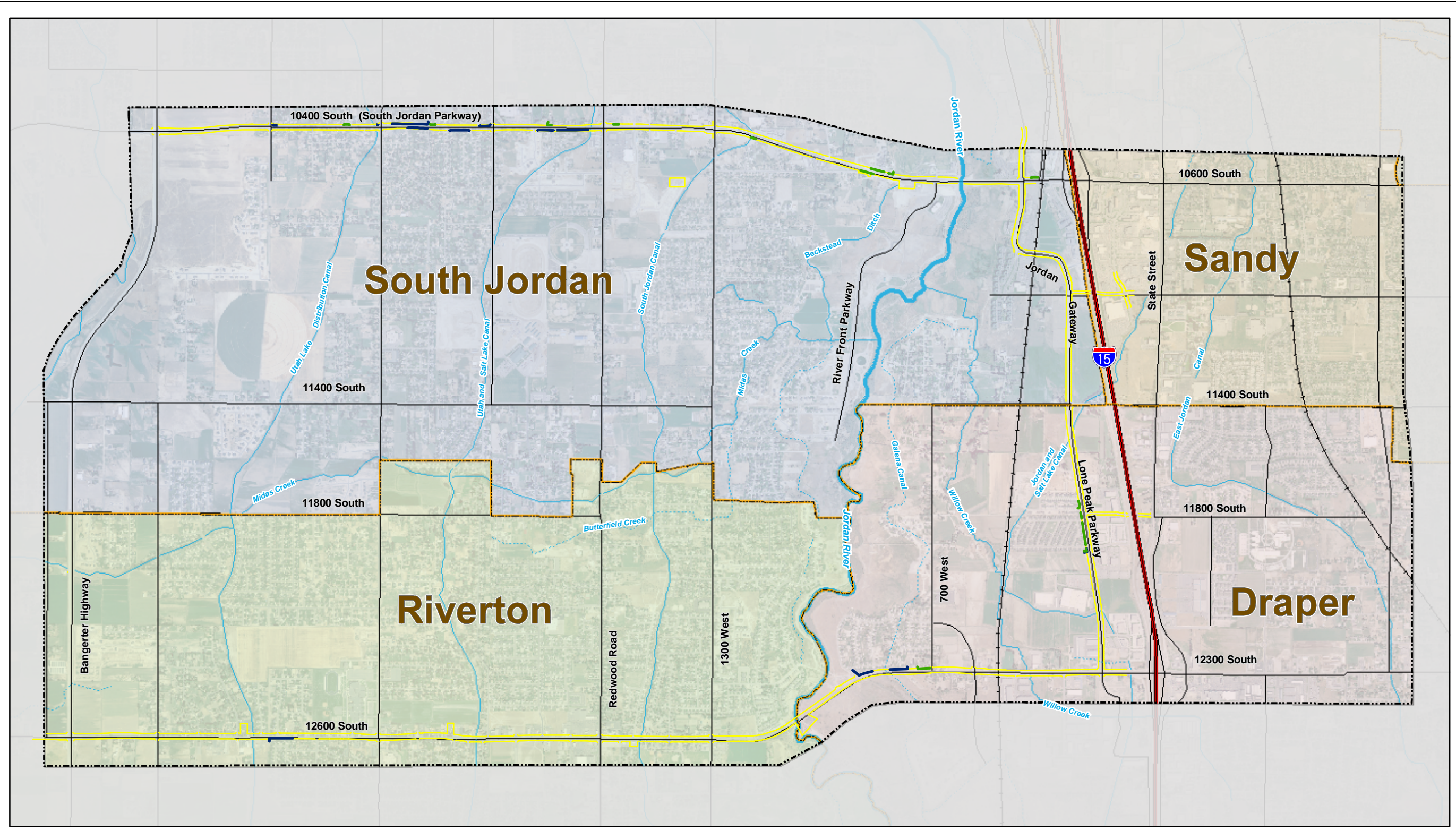
d These barrier heights do not include the cut wall heights.

n/b: no benefited residence



- | | | | |
|--|---------------------------------|--|-------------------------------|
| | Existing Wall/Berm | | Alternative Right-of-Way Line |
| | Proposed Noise Wall | | City Boundary |
| | Perennial Streams and Canals | | |
| | Intermittent Streams and Canals | | |

Figure 4-3a. Alternative 1
Proposed and Existing
Noise Walls



0.2 0 0.2 0.4
Miles

- | | | | |
|--|---------------------------------|--|-------------------------------|
| | Existing Wall/Berm | | Alternative Right-of-Way Line |
| | Proposed Noise Wall | | City Boundary |
| | Perennial Streams and Canals | | |
| | Intermittent Streams and Canals | | |

Figure 4-3b. Alternative 3a
Proposed and Existing
Noise Walls

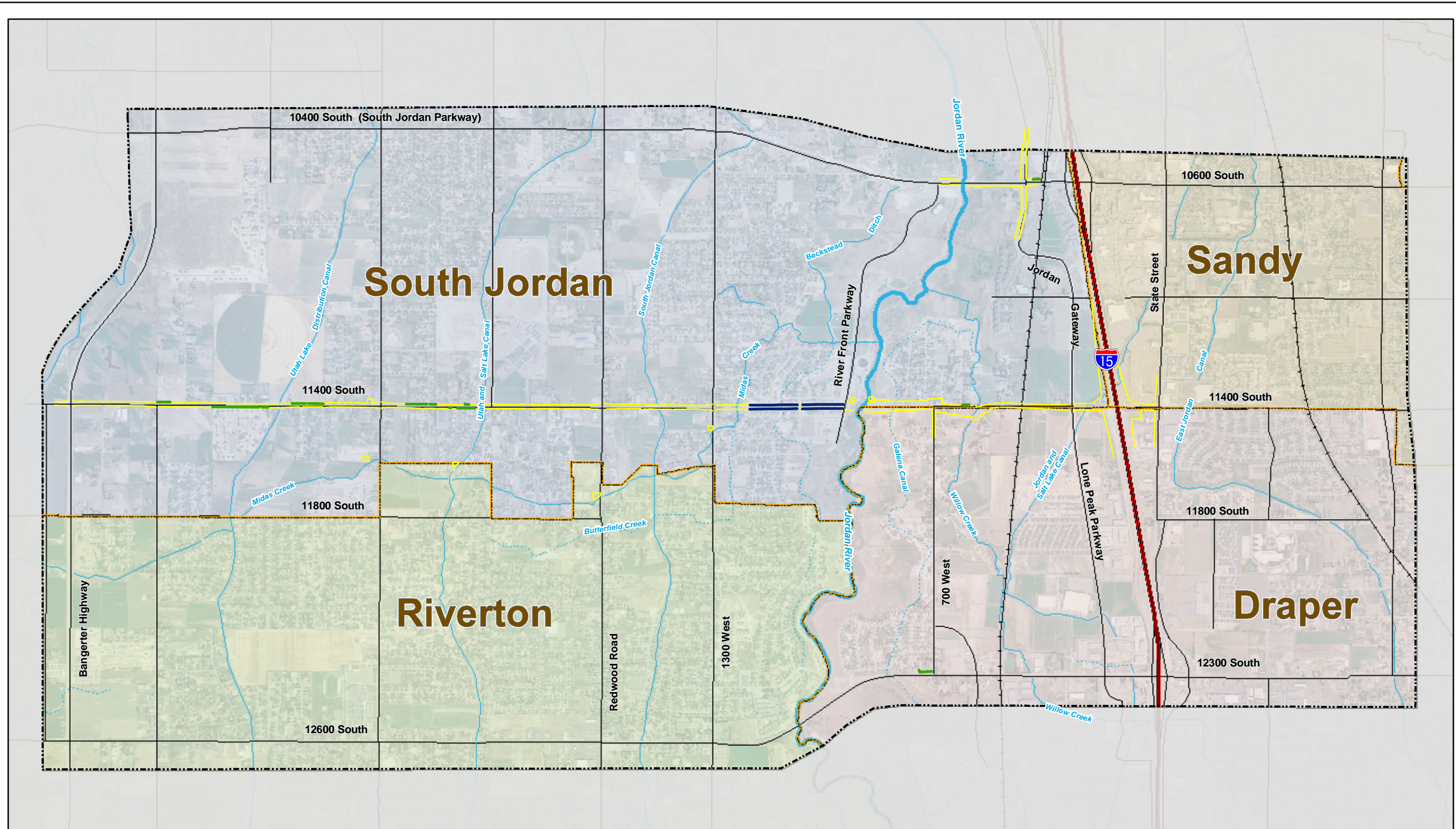


Figure 4-3c. Alternative 4
Proposed and Existing
Noise Walls

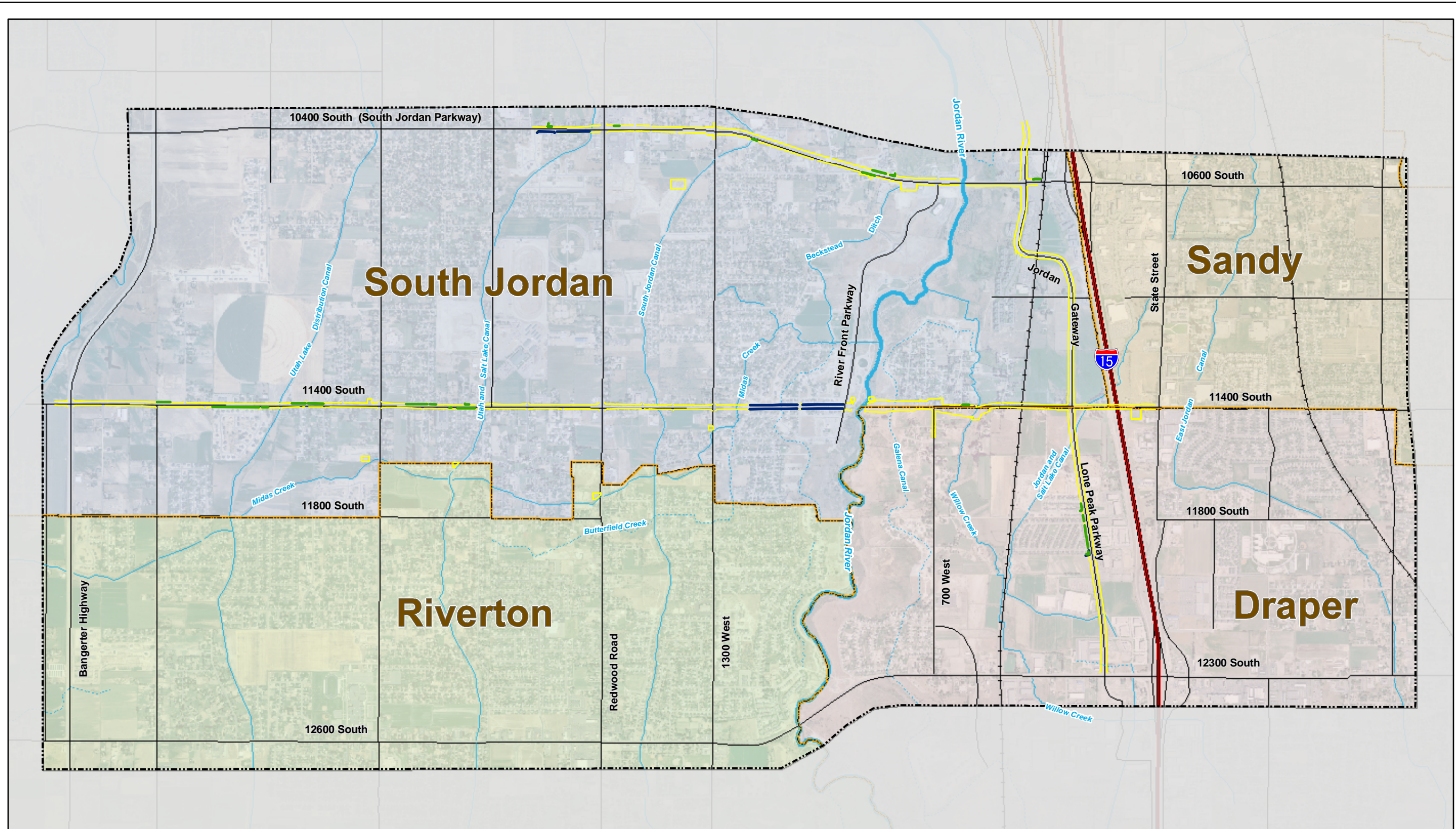


Figure 4-3d. Alternative 7
Proposed and Existing
Noise Walls

Alternative 1

SW Corner Residence at 10430 South 3200 West

The barrier was analyzed in front of 10430 South 3200 West to analyze the noise benefits to one residence. The barrier would be approximately 222 feet long and 12 feet tall. A 3.1 dBA reduction would be realized at one residence. The cost of the noise barrier would be \$22,640, with no benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction.

NE Corner Residence at 10391 South 3200 West

The barrier was analyzed in front of 10391 South 3200 West to analyze the noise benefits to one residence. The barrier would be approximately 146 feet long and 9 feet tall. A 5.5 dBA reduction would be realized at one residence. The cost of the noise barrier would be \$13,140 for one residence. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

NE Corner Residence at 10381 South 2840 West

The barrier was analyzed in front of 10381 South 2840 West to analyze the noise benefits to one residence. The barrier would be approximately 120 feet long and 12 feet tall. A 3.6 dBA reduction would be realized at one residence. The cost of the noise barrier would be \$14,400, with no benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction.

NW Corner Residence at 10378 South 2700 West

The barrier was analyzed in front of 10378 South 2700 West to analyze the noise benefits to one residence. The barrier would be

approximately 76 feet long and 8.5 feet tall. A 5.1 dBA reduction would be realized at one residence. The cost of the noise barrier would be \$6,460 for one residence. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

North Side of 10400 South at 2600 West

The barrier would run from 10394 South Cherry Grove Lane to 2627 West. The barrier would be approximately 928 feet long and 6 feet tall. A 6.6 to 9.3 dBA reduction would be realized at eight front row residences. The cost of the noise barrier would be \$55,640, resulting in a cost per benefited residence of \$6,955. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

South Side of 10400 South at 2500 West

The barrier would run from Northforty Way to Settlers Bend Road. The barrier would be approximately 514 feet long and 6 feet tall. A 5.0 to 7.3 dBA reduction would be realized at five front row residences. The cost of the noise barrier would be \$30,840, resulting in a cost per benefited residence of \$6,168. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

South Side of 10400 South at 2300 West

The barrier would run from Hidden Crest Way to Featherwood Drive. The barrier would be approximately 533 feet long and 10 feet tall. A 5.0 to 5.6 dBA reduction would be realized at four front row residences. The cost of the noise barrier would be \$53,300,

resulting in a cost per benefited residence of \$13,325. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

North Side of 10400 South at 2200 West

The barrier would run from 2200 West to Temple View Drive. The barrier would be approximately 327 feet long and 6.5 feet tall. A 5.5 dBA reduction would be realized at two front row residences. The cost of the noise barrier would be \$21,260, resulting in a cost per benefited residence of \$10,630. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

South Side of 10400 South at Approximately 10430 South Culmination St. (2010 West)

The barrier was analyzed in front of the residence at approximately 104030 South Culmination Drive. The barrier would be approximately 117 feet long and 12 feet tall. A 3.0 dBA reduction would be realized at one residence. The cost of the noise barrier would be \$14,040, with no benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction.

South Side of 10400 South Between Gladys Dr. (1925 West) and Culmination St. (2010 West)

The barrier would run from Gladys Dr. to Culmination St. The barrier would be approximately 436 feet long and 8 feet tall. A 4.2 to 5.9 dBA reduction would be realized at four front row residences with 3 residences experiencing a 5 dBA noise reduction. The cost of the noise barrier would be \$34,800 resulting in a cost per benefited residence of \$11,627. The barrier would

achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

South Side of 10400 South at 1547 West

A barrier was analyzed in front of 1547 West to analyze the noise benefits to two residences impacted by 10400 South. The barrier would be approximately 138 feet long and 12 feet tall. A 1.6 to 2.8 dBA reduction would be realized at two residences. The cost of the noise barrier would be \$16,560, with no benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction.

North Side of 11400 South at 800 West

Two adjacent barriers were analyzed on the north side of 11400 South bordering the residential properties at the south end of Berg Hollow Lane (805 West) and Rick Circle (765 West). Two barriers were needed as a result of changing terrain. Together, the barriers would be approximately 520 feet long and 12 feet tall. A 0.7 to 3.0 dBA reduction would be realized at four residences. The cost of the noise barrier would be \$62,400, with no benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction.

North and South Sides of 11400 South from River Front Parkway to 1300 West

As 11400 South did not previously pass through this area, existing traffic data is not available for these receivers. Ambient noise levels in rural areas are typically around 45 dBA. The possible barriers for this area are described below.

North Side of 11400 South between River Front Parkway (900 West) and Chapel View Dr. (1060 West)

The barrier would be approximately 971 feet long and 10 feet tall. A 5.4 to 11.3 dBA reduction would be realized at 10 front row residences. The cost of the noise barrier would be \$97,100 resulting in a cost per benefited residence of \$9,710. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

South Side of 11400 South between River Front Parkway and Chapel View Dr.

The barrier would be approximately 965 feet long and 12 feet tall. A 5.2 to 6.9 dBA reduction would be realized at nine front row residences. The cost of the noise barrier would be \$115,800 resulting in a cost per benefited residence of \$12,867. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

North Side of 11400 South between Chapel View Dr. and Palisade Rim Dr.

The barrier would be approximately 1,127 feet long and between 6 and 8 feet tall; these heights are on top of the large cut wall proposed for this area. A 5.0 to 10.3 dBA reduction would be realized at 12 residences. The cost of the noise barrier would be \$94,710 resulting in a cost per benefited residence of \$7,893. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

South Side of 11400 South between Chapel View Dr. and Palisade Rim Dr

The barrier would be approximately 1,126 feet long and between 4 and 12 feet tall; these heights are on top of the large cut wall proposed for this area. A 4.0 to 10.3 dBA reduction would be realized at 11 front row residences with eight residences experiencing a 5 dBA noise reduction. The cost of the noise barrier would be \$100,460 resulting in a cost per benefited residence of \$12,558. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

North Side of 11400 South between Palisade Rim Dr. and 1300 West

The barrier would be approximately 741 feet long and between 12 feet tall. A 3.7 to 5.2 dBA reduction would be realized at three front row residences with 1 residence experiencing a 5 dBA noise reduction. The cost of the noise barrier would be \$88,920 with one benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction and it would not meet the \$25,000 cost reasonableness criteria.

South Side of 11400 South between Palisade Rim Dr. and 1300 West

The barrier would be approximately 735 feet long and between 12 feet tall. A 2.5 to 3.9 dBA reduction would be realized at two front row residences. The cost of the noise barrier would be \$88,220 with no benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction and it would not meet the \$25,000 cost reasonableness criteria.

South Side of 12600 South at 3150 West

The barrier would run from 3110 West to 3168 West. The barrier would be approximately 628 feet long and 8 feet tall. A 5.0 to 6.1 dBA reduction would be realized at six front row residences. The cost of the noise barrier would be \$44,000, resulting in a cost per benefited residence of \$7,333. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

NE Corner Residence at Approximately 12594 South 1540 West

The barrier was analyzed in front of the residence at approximately 12594 South 1540. The barrier would be approximately 81 feet long and 12 feet tall. A 2.3 dBA reduction would be realized at one residence. The cost of the noise barrier would be \$9,720, with no benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction.

North Side of 12300 South at 940 West

The barrier would run from 897 West to 943 West. The barrier would be approximately 541 feet long and 6 feet tall. A 3.6 to 5.7 dBA reduction would be realized at five front row residences; 4 residences would see a 5 dBA or greater reduction. The cost of the noise barrier would be \$32,470, resulting in a cost per benefited residence of \$8,118. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

North Side of 12300 South at 800 West

The barrier would run from 12269 South Stevens Circle to 827 West. The barrier would be approximately 469 feet long and 8 feet

tall. A 5.1 to 8.4 dBA reduction would be realized at four residences. The cost of the noise barrier would be \$37,540, resulting in a cost per benefited residence of \$9,385. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

Alternative 3A

SW Corner Residence at 10430 South 3200 West

The barrier was analyzed in front of 10430 South 3200 West to analyze the noise benefits to one residence. The barrier would be approximately 222 feet long and 12 feet tall. A 3.1 dBA reduction would be realized at one residence. The cost of the noise barrier would be \$22,640, with no benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction.

NE Corner Residence at 10391 South 3200 West

The barrier was analyzed in front of 10391 South 3200 West to analyze the noise benefits to one residence. The barrier would be approximately 146 feet long and 9 feet tall. A 5.4 dBA reduction would be realized at one residence. The cost of the noise barrier would be \$13,140 for one residence. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

NE Corner Residence at 10381 South 2840 West

The barrier was analyzed in front of 10381 South 2840 West to analyze the noise benefits to one residence. The barrier would be approximately 120 feet long and 12 feet tall. A 2.8 dBA reduction would be realized at one residence. The cost of the noise barrier

would be \$14,400, with no benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction.

NW Corner Residence at 10378 South 2700 West

The barrier was analyzed in front of 10378 South 2700 West to analyze the noise benefits to one residence. The barrier would be approximately 76 feet long and 8.5 feet tall. A 5.2 dBA reduction would be realized at one residence. The cost of the noise barrier would be \$6,460 for one residence. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

North Side of 10400 South at 2600 West

The barrier would run from 10394 South Cherry Grove Lane to 2627 West. The barrier would be approximately 928 feet long and 6 feet tall. A 6.9 to 9.0 dBA reduction would be realized at eight front row residences. The cost of the noise barrier would be \$55,640, resulting in a cost per benefited residence of \$6,955. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

South Side of 10400 South at 2500 West

The barrier would run from Northforty Way to Settlers Bend Road. The barrier would be approximately 514 feet long and 6 feet tall. A 5.4 to 6.3 dBA reduction would be realized at five front row residences. The cost of the noise barrier would be \$30,840, resulting in a cost per benefited residence of \$6,168. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would

meet the \$25,000 cost reasonableness criteria per benefited receiver.

South Side of 10400 South at 2300 West

This barrier is not necessary for Alternative 3A, as the expected noise level at receiver R205 is below 65 dBA and, therefore, does not require noise mitigation.

North Side of 10400 South at 2200 West

The barrier would run from 2200 West to Temple View Drive. The barrier would be approximately 327 feet long and 6.5 feet tall. A 5.4 dBA reduction would be realized at two front row residences. The cost of the noise barrier would be \$21,260, resulting in a cost per benefited residence of \$10,630. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

South Side of 10400 South at 1547 West

A barrier was analyzed in front of 1547 West to analyze the noise benefits to two residences impacted by 10400 South. The barrier would be approximately 138 feet long and 12 feet tall. A 2.2 to 4.0 dBA reduction would be realized at two residences. The cost of the noise barrier would be \$16,560, with no benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction.

South Side of 12600 South at 3150 West

The barrier would run from 3110 West to 3168 West. The barrier would be approximately 628 feet long and 8 feet tall. A 4.8 to 6.0 dBA reduction would be realized at six front row residences, with four benefited residences. The cost of the noise barrier would be \$44,000, resulting in a cost per benefited residence of \$22,000. The barrier would achieve the UDOT feasibility standard of 5 dBA

or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

NE Corner Residence at Approximately 12594 South 1540 West

The barrier was analyzed in front of the residence at approximately 12594 South 1540. The barrier would be approximately 81 feet long and 12 feet tall. A 2.2 dBA reduction would be realized at one residence. The cost of the noise barrier would be \$9,720, with no benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction.

North Side of 12300 South at 940 West

The barrier would run from 897 West to 943 West. The barrier would be approximately 541 feet long and 6 feet tall. A 3.7 to 5.8 dBA reduction would be realized at five front row residences; four residences would see a 5 dBA or greater reduction. The cost of the noise barrier would be \$32,470, resulting in a cost per benefited residence of \$8,118. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

North Side of 12300 South at 800 West

The barrier would run from 12269 South Stevens Circle to 827 West. The barrier would be approximately 469 feet long and 8 feet tall. A 5.0 to 8.5 dBA reduction would be realized at four residences. The cost of the noise barrier would be \$37,540, resulting in a cost per benefited residence of \$9,385. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

West Side of Lone Peak Parkway Between Inauguration Rd. (11815 S.) and Bubbling Brook Dr.

The barrier was analyzed in front of two residences between Inauguration Rd. and Bubbling Brook Dr. on the west side of Lone Peak Parkway. The barrier would be approximately 164 feet long and 12 feet tall. A 1.0-2.6 dBA reduction would be realized at two residences. The cost of the noise barrier would be \$19,680, with no benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction.

SW Corner Residence at Lone Peak Parkway and Election Rd. (11895 S.)

The barrier was analyzed in front of one residence on the SW Corner of Lone Peak Parkway and Election Road. The barrier would be approximately 197 feet long and 12 feet tall. A 5.6 dBA reduction would be realized at one residence. The cost of the noise barrier would be \$23,640 for the one residence. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

Alternative 4

Northeast Corner of 11400 South and 445 West

The barrier would be approximately 98 feet long and 12 feet tall. A 4.0 dBA reduction would be realized at one residence. The cost of the noise barrier would be \$11,760, with no benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction.

North Side of 11400 South at 800 West

Two adjacent barriers were analyzed on the north side of 11400 South bordering the residential properties at the south end of Berg

Hollow Lane (805 West) and Rick Circle (765 West). Two barriers were needed as a result of changing terrain. Together, the barriers would be approximately 520 feet long and 12 feet tall. A 0.7 to 3.1 dBA reduction would be realized at four residences. The cost of the noise barrier would be \$62,400, with no benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction.

North Side of 11400 South between River Front Parkway (900 West) and Chapel View Dr. (1060 West)

The barrier would be approximately 971 feet long and 12 feet tall. A 3.7 to 7.2 dBA reduction would be realized at 10 front row residences, five residences would have 5dBA or more noise reduction. The cost of the noise barrier would be \$116,580 resulting in a cost per benefited residence of \$23,316. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

South Side of 11400 South between River Front Parkway and Chapel View Dr.

The barrier would be approximately 965 feet long and 12 feet tall. A 4.3 to 7.2 dBA reduction would be realized at nine front row residences, with four residences experiencing a 5 dBA or more noise reduction. The cost of the noise barrier would be \$115,800 resulting in a cost per benefited residence of \$28,950. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would not meet the \$25,000 cost reasonableness criteria per benefited receiver.

North Side of 11400 South between Chapel View Dr. and Palisade Rim Dr.

The barrier would be approximately 1,127 feet long and between 6 and 8 feet tall; these heights are on top of the large cut wall proposed for this area. A 4.1 to 9.8 dBA reduction would be realized at 12 residences, with nine residences experiencing a 5 dBA or greater noise reduction. The cost of the noise barrier would be \$94,710 resulting in a cost per benefited residence of \$10,523. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

South Side of 11400 South between Chapel View Dr. and Palisade Rim Dr.

The barrier would be approximately 1,126 feet long and between 4 and 12 feet tall; these heights are on top of the large cut wall proposed for this area. A 5.1 to 9.1 dBA reduction would be realized at 11 front row residences. The cost of the noise barrier would be \$100,460 resulting in a cost per benefited residence of \$12,558. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

North Side of 11400 South between Palisade Rim Dr. and 1300 West

The barrier would be approximately 741 feet long and 12 feet tall. A 3.6 to 5.1 dBA reduction would be realized at three front row residences with 1 residence experiencing a 5 dBA noise reduction. The cost of the noise barrier would be \$88,920 with one benefited residence. The barrier would not achieve the UDOT

feasibility standard of 5 dBA or greater noise reduction and it would not meet the \$25,000 cost reasonableness criteria.

South Side of 11400 South between Palisade Rim Dr. and 1300 West

The barrier would be approximately 735 feet long and 12 feet tall. A 2.3-3.8 dBA reduction would be realized at two front row residences. The cost of the noise barrier would be \$88,220 with no benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction and it would not meet the \$25,000 cost reasonableness criteria.

Alternative 7

South Side of 10400 South Between Gladys Drive (1925 West) and the Utah and Salt Lake Canal

The barrier would run from Gladys Dr. to the Utah/Salt Lake Canal. The barrier would be approximately 843 feet long and 8 feet tall. A 2.9 to 6.2 dBA reduction would be realized at five front row residences with four residences experiencing a 5 dBA noise reduction. The cost of the noise barrier would be \$67,440 resulting in a cost per benefited residence of \$16,860. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

South Side of 10400 South at 1547 West

A barrier was analyzed in front of 1547 West to analyze the noise benefits to two residences impacted by 10400 South. The barrier would be approximately 138 feet long and 12 feet tall. A 1.6 to 3.8 dBA reduction would be realized at two residences. The cost of the noise barrier would be \$16,560, with no benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction.

North Side of 11400 South at 800 West

Two adjacent barriers were analyzed on the north side of 11400 South bordering the residential properties at the south end of Berg Hollow Lane (805 West) and Rick Circle (765 West). Two barriers were needed as a result of changing terrain. Together, the barriers would be approximately 520 feet long and 12 feet tall. A 0.7 to 3.0 dBA reduction would be realized at four residences. The cost of the noise barrier would be \$62,400, with no benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction.

North Side of 11400 South between River Front Parkway (900 West) and Chapel View Dr. (1060 West)

The barrier would be approximately 971 feet long and 10 feet tall. A 5.5 to 11.4 dBA reduction would be realized at 10 front row residences. The cost of the noise barrier would be \$97,100 resulting in a cost per benefited residence of \$9,710. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

South Side of 11400 South between River Front Parkway and Chapel View Dr.

The barrier would be approximately 965 feet long and 8 feet tall. A 5.8 to 9.2 dBA reduction would be realized at nine front row residences. The cost of the noise barrier would be \$77,200 resulting in a cost per benefited residence of \$8,578. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

North Side of 11400 South between Chapel View Dr. and Palisade Rim Dr.

The barrier would be approximately 1,127 feet long and between 6 and 8 feet tall; these heights are on top of the large cut wall proposed for this area. A 3.9 to 10.0 dBA reduction would be realized at 12 residences, with nine residences experiencing a 5 dBA or greater noise reduction. The cost of the noise barrier would be \$94,710 resulting in a cost per benefited residence of \$10,523. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

South Side of 11400 South between Chapel View Dr. and Palisade Rim Dr.

The barrier would be approximately 1,126 feet long and between 4 and 12 feet tall; these heights are on top of the large cut wall proposed for this area. A 5.1 to 10.0 dBA reduction would be realized at 11 front row residences. The cost of the noise barrier would be \$93,580 resulting in a cost per benefited residence of \$8,507. The barrier would achieve the UDOT feasibility standard of 5 dBA or greater noise reduction for the majority of front-row receivers, and it would meet the \$25,000 cost reasonableness criteria per benefited receiver.

North Side of 11400 South between Palisade Rim Dr. and 1300 West

The barrier would be approximately 741 feet long and 12 feet tall. A 3.6 to 5.2 dBA reduction would be realized at three front row residences with one residence experiencing a 5 dBA noise reduction. The cost of the noise barrier would be \$88,920 with one benefited residence. The barrier would not achieve the UDOT

feasibility standard of 5 dBA or greater noise reduction and it would not meet the \$25,000 cost reasonableness criteria.

South Side of 11400 South between Palisade Rim Dr. and 1300 West

The barrier would be approximately 735 feet long and 12 feet tall. A 2.2 to 3.9 dBA reduction would be realized at two front row residences. The cost of the noise barrier would be \$88,220 with no benefited residences. The barrier would not achieve the UDOT feasibility standard of 5 dBA or greater noise reduction and it would not meet the \$25,000 cost reasonableness criteria.

4.8 Direct and Indirect Impacts to Water Resources

This section describes the potential water quality impacts on surface water, floodplains, and groundwater due to the alternatives being considered in this FEIS. Construction impacts on surface water from the alternatives being considered are discussed in Section 4.16, *Construction Impacts*. Cumulative impacts on surface water as a result of expected growth in the study area are discussed in Section 4.19 *Cumulative Impacts*.

Potential impacts to water quality were assessed in consultation with representatives from the FHWA, Utah Department of Environmental Quality (DWEQ), and UDOT.

4.8.1 Surface Water

Road improvement due to the permanent change in surface conditions can potentially impact surface water. Long-term impacts to surface water include potential increase of surface runoff due to addition of impervious surface areas. In addition, the increased road surface would require additional salt application for roadway deicing activities during winter storm events. This would

increase the total dissolved solids (TDS) concentrations in the surface runoff.

Through discussions with FHWA, DWQ, and UDOT, it was decided that that heavy metals (copper, lead, and zinc), total suspended solids (TSS), TDS, and dissolved oxygen (DO) would be evaluated in this FEIS to determine the impact to surface waters. It is estimated that the concentrations of the pollutant of concern in the surface water runoff are similar to the mean concentrations observed during storm events for Salt Lake County (Stantec, Sept 2000). These pollutant concentrations are shown in Table 4-14. TDS concentrations in storm runoff vary greatly based on land use and increase in winter during deicing activities.

Table 4-14.
Pollutant of Concern in Surface Water Runoff

Constituent	EMC (mg/L)
Total Copper	0.039
Total Lead	0.031
Total Zinc	0.181
TSS	116
TDS (April, May, June, Sept, Oct)	800
BOD-5	13.2

Source: *Stormwater Quality Data Technical Report*, Salt Lake County, UT Sept 2000.
EMC = Event mean concentration; TSS = Total suspended solids; TDS = Total dissolved solids; BOD-5 = 5-day Biochemical oxygen demand

The Build Alternatives considered in this FEIS cross seven rivers, streams, and canals, as shown in Table 4-15. There is one canal, one river, and two streams that would receive discharge from the Build Alternatives. Two of the water bodies receive discharge at multiple locations along their length.

Table 4-15.
Surface Waters Crossed by Build Alternatives

Rivers and Canals in Study Area	Crossed by Alternatives
Utah Lake Distributing Canal	1, 3A, 4, 7
Utah and Salt Lake Canal	1, 3A, 4, 7
South Jordan Canal	1, 3A, 4, 7
Midas Creek	1, 4, 7
Jordan River	1, 3A, 4, 7
Willow Creek	1, 3A, 4, 7
Jordan and Salt Lake Canal	1, 3A, 4, 7

The DWQ conducts in-stream monitoring at several locations along the Jordan River. The Bluffdale Road monitoring site is the site closest to the project study area. Based on monitoring results collected between 2000 and 2004, the levels of copper, lead, and zinc in the Jordan River are below the analytical detection limit. Levels of TDS for the same time period range from 554 mg/l to 1282 mg/l, with an average of 1018 mg/l and a maximum of 1282 mg/l, with the higher concentrations typically occurring in the winter months. The DWQ does not have monitoring stations along Willow Creek or Midas Creek. However, as these creeks are tributaries to the Jordan River, in-stream concentrations should be similar.

In the study area, storm water is either discharged directly into the receiving waters or is conveyed to detention basins before being released to the receiving waters. Table 4-16 shows the receiving water bodies, location of discharge along those water bodies, and which alternatives discharge into that water body.

Table 4-16.
Surface Water Discharge Locations

Receiving Water and Location	Alternatives Discharging into Water Body
Midas Creek at 11500 South	No Build, 1, 4, 7
Willow Creek at 11400 South	No Build, 1, 3A, 4, 7
Willow Creek at 12600 South	No Build, 1, 3A, 7
Jordan River at 10600 South	No Build, 1, 3A, 4, 7
Jordan River at 11400 South	No Build, 1, 4, 7
Jordan River at 12300/12600 South	No Build, 1, 3A
South Jordan Canal at 1500 West	No Build, 1, 3A

To quantify the impacts to the various receiving waters within the study area from each alternative, the increase over existing conditions in storm water runoff from a ten-year storm event was calculated for each alternative and is summarized below:

- Alternative 1: 95.3 cubic feet per second (cfs)
- Alternative 3A: 72.1 cfs
- Alternative 4: 42.1 cfs
- Alternative 7: 57.9 cfs

The increase in storm water runoff is caused by the increase in impervious roadway pavement and is therefore greatest for Alternative 1, which has the most roadway widening/new roadway acreage. These values represent the undetained flow rates, and therefore worst-case conditions. Existing and planned detention ponds would be available under all alternatives to decrease runoff rates and reduce sediment transport. Detailed calculations are presented in Appendix I.

The calculated flow rates for each receiving stream were provided to DWQ to determine the impact that Alternative 1 would have on the receiving waters. To determine water quality impacts, the

DWQ ran their waste-load allocation model. This model considers the current pollutant concentrations in the receiving water – in this analysis, the pollutant parameters considered were copper, lead, and zinc. Using the 10-year low-flow values for the receiving stream, and the maximum quantity of run-off that would be added to the receiving stream from a 10-year storm event (assuming the flow rate would be maintained for up to two hours), the mass of pollutant that could be added to the river without causing a violation of the state's in-stream water quality criteria was calculated. This mass was then converted to a pollutant concentration based on the flow expected from the 10-year storm event.

Table 4-17 shows the storm water pollutant concentrations that would be allowable for each receiving stream, compared to the expected storm runoff concentrations. As shown in the table, in all cases, the expected runoff values are well below the concentrations that would cause a water quality concern or a violation of state water quality standards. All receiving streams would be protected for their beneficial uses of secondary contact recreation, aquatic wildlife, and agricultural uses. Therefore, no adverse impacts to water quality in the study area due to elevated metals concentrations are expected from any of the Build Alternatives.

Table 4-17.
Allowable Run-off Concentrations (mg/l)

Pollutant Parameter	EMC	Jordan River	Willow Creek	Midas Creek
Copper	0.039	0.124	0.067	0.065
Lead	0.031	0.084	0.044	0.043
Zinc	0.181	1.819	0.947	0.919

EMC = event mean concentration

The Jordan River, Willow Creek, Midas Creek, and the South Jordan Canal are protected by the State for agricultural use of these waterways, which includes irrigation of crops and stock watering. The state standard for TDS is 1200 mg/l for crop irrigation and 2000 mg/l for stock watering. In the summer the typical TDS concentrations in storm runoff are below the State standards and are also below the average in-stream TDS concentrations observed in the Jordan River. Therefore, summer storm events would actually help to lower TDS concentrations in the river.

In the colder months, deicing salts applied during winter storm conditions would be expected to increase TDS loadings into the study area receiving streams. These potentially elevated levels of TDS would occur outside the irrigation season. During the winter months, the agricultural use would be stock watering and the water quality standard would increase to 2000 mg/l.

UDOT specifications call for deicing salts to be applied at a lane rate of 150 pounds per mile (per UDOT Region 2 Maintenance Manager). Table 4-18 below shows the number of new lane miles and the associated pounds of additional salt that would be applied to the study area corridors from each Build Alternative. Assuming that all the salt would reach the receiving streams as TDS during a ten-year two-hour storm event, the expected increase in TDS concentration in the study area runoff can be calculated by dividing the new salt loading by the surface water flow increases caused by each alternative. Adding this to the EMC of TDS in runoff without deicing salts gives a TDS concentration of less than 1000 mg/l for each Build Alternative. While this is higher than the average TDS concentration in the Jordan River, it is not expected to cause impairment of the receiving stream.

Table 4-18.
Expected TDS Concentrations During Winter Storm Events

	Alt 1	Alt 3A	Alt 4	Alt 7
New lane miles	35.5	25.4	15.6	22.1
Additional salt applied (lbs)	5,325	3,810	2,340	3,315
Increased runoff (gallons)	5,132,477	3,883,018	2,267,338	3,118,262
Increase in TDS over EMC (mg/l)	124	118	124	127
Expected winter TDS (mg/l)	924	918	924	927

TSS concentrations would be controlled through the use of storm water detention basins. The settling time would allow the TSS concentrations in the basin effluent to achieve the state standard of 25 mg/l. The mean concentration of BOD-5 in storm water runoff is 13.2 mg/l. This is well below the state standard of 25 mg/l. Therefore there are no anticipated impacts to water quality based on TSS and BOD-5 pollutant contributions from any of the Build Alternatives.

Appendix I, Storm Water Analysis, includes a figure that shows the proposed and existing drainage systems for the study area. The alternative alignment figures in Section 2 show the proposed drainage systems for each alternative. Below is a discussion of the proposed drainage systems for each alternative, followed by Table 4-19, which summarizes the existing and proposed drainage systems for each alternative.

4.8.1.1 Direct Impacts to Surface Waters

No Build Alternative

Under the No-Build Alternative, there would be no additional direct impacts to surface water based on roadway construction.

Alternative 1

Alternative 1 crosses the Utah Lake Distributing Canal, Utah and Salt Lake Canal, South Jordan Canal, Midas Creek, Jordan River, Willow Creek, Jordan and Salt Lake Canal. Impacts to surface water during construction include potential increases in surface water flow and pollutant concentrations to receiving waters. Best management practices specified in the Storm Water Pollution Prevention Plan for the project would be used during construction to minimize impacts to surface water. Long-term impacts to surface water from Alternatives 1 include increased discharge and pollutant load to the Jordan River, Midas Creek, Willow Creek, and South Jordan Canal. As mentioned above, the DWQ has determined that impacts due to the increase in surface runoff from Alternative 1 would not cause water quality standards for metals to be exceeded in the Jordan River, Midas Creek, or Willow Creek. The DWQ has not established metals standards for the South Jordan Canal. The TDS standard of 1200 mg/l would not be exceeded in any waterway, and the Total Suspended Solids (TSS) standard would be achieved by the use of the detention basins included with this alternative.

As a result of increased surface runoff, some drainage system and detention basins would require construction or improvement. For Alternative 1, storm water will be managed with the proposed drainage system and detention basins listed in Table 4-19. The proposed system includes installation of six new detention basins and associated drain system for the drainage of 11400 South. In addition, detention basins used for the drainage of 12600 South/12300 South, Jordan Gateway / Lone Peak Parkway, and

State Street may need to be redesigned to accommodate a 30 percent increase in flow.

Alternative 3A

Alternative 3A crosses all rivers and canals, except for Midas Creek, that are crossed by Alternative 1. Long- and short-term impacts to surface water would be less than that for Alternative 1 therefore, this alternative would not cause any surface water quality standards to be exceeded.

Additional surface runoff from Alternative 3A will be managed with the proposed drainage system described in Table 4-19. The proposed system includes installation of one detention basin on 11400 South and Willow Creek for the drainage of the Jordan Gateway/Lone Peak Parkway corridor. In addition, detention basins used for the drainage of 12600/12300 South may need to be redesigned to accommodate a 30 percent increase in flow.

Alternative 4

Alternative 4 crosses all rivers and canals that are crossed by Alternative 1, and includes the additional impervious surface associated with the I-15 interchange. Long- and short-term impacts to surface water would be less than that for Alternative 1, therefore, this alternative would not cause any surface water quality standards to be exceeded.

Increases in storm water runoff due to Alternative 4 would be managed with the proposed drainage system shown in Table 4-19. Measures to mitigate surface water impacts include the installation of six new detention basins and associated drain lines for the drainage of 11400 South.

Alternative 7

Alternative 7 crosses all rivers and canals that are crossed by Alternative 1. Long- and short-term impacts to surface water

would be less than that for Alternative 1, therefore, this alternative would not cause any surface water quality standards to be exceeded.

The proposed drainage system for this alternative is presented in Table 4-19. Six new detention basins and associated drain system would be required to manage the additional flow on 11400 South. Also, improvements to the detention basins used for the drainage of Jordan Gateway/Lone Peak Parkway and State Street may be required to accommodate a 30 percent flow increase.

4.8.1.2 Indirect Impacts to Surface Waters

Indirect impacts to water quality were calculated for each of the Build Alternatives (see Appendix I). These impacts would result from increased storm water runoff due to increased paved areas for commercial development. Areas of induced commercial growth were shown previously on Figure 4-1. As discussed in Section 4.1, no induced residential growth is expected from any of the Build Alternatives. As there is no new induced commercial or residential growth expected from either the No Build Alternative or Alternative 3A, there are no expected indirect impacts to surface water quality from these two alternatives.

Under Alternatives 1, 4, and 7, there would be increased runoff into Midas Creek from approximately 10 acres of expected commercial development in the Redwood Road/11400 South area. There would also be increased runoff into Willow Creek from expected commercial development in the Jordan Gateway/11400 South area. The size of this development is estimated at 137 acres for Alternative 1, 129 acres for Alternative 4, and 132 acres for Alternative 7.

Runoff TSS concentrations into both Midas Creek and Willow Creek would be controlled by the use of detention basins which are required by South Jordan, Draper, and Sandy Cities for all

new commercial development. Parking lots are not typically salted to the extent roadways are, so the new development would not be expected to cause TDS violations in Midas Creek or Willow Creek.

As shown in Appendix I, the increased runoff from a 10-year 2-hour storm event would not cause water quality standards in Midas Creek to be exceeded. Metals concentrations may elevate slightly, but this would be only during the runoff events.

Based on the runoff analysis for Willow Creek, increased runoff from commercial development may cause slight elevations over Class 3 water quality standards. Again, this elevation would occur only during runoff events. The conservative analysis assumes 10-year 7-day low flow conditions in Willow Creek, which would generally not be the case during a 10-year storm event. In addition, the city-required detention basins for commercial development would result in settling of suspended matter, helping to lower the metals concentrations in the runoff.

4.8.1.3 Mitigation Measures for Impacts to Surface Waters

Impacts to surface waters would be mitigated by the use of detention basins for all new discharges into creeks and canals. In addition, during final design it will be determined if the existing storm drainage into the Jordan River on 10600 South could be diverted through the wetlands located on the northeast corner to improve runoff quality through the biofiltration process.

UDOT would continue to work with the study area cities throughout the project design phase to assure coordination with the cities' stormwater program requirements. If requested, UDOT would provide accommodations for automated samplers at any newly constructed or modified detention basins. The municipalities would be responsible for supplying and maintaining the samplers.

**Table 4-19.
Storm Drainage System**

Outfall Locations	Receiving Water	Segment Serviced	Comments	Alternatives Affected
10400 South / 10600 South				
Detention pond adjacent to Beckstead Lane	South Jordan Canal	Bangerter Highway to Redwood Road	Existing pond capacity will handle additional flow. Additional analysis required to determine if drainage system can handle additional 30% flow.	1, 3A, 7
Detention pond at 10600 South 1000 West	Jordan River	Bangerter Highway to 900 West	Existing pond capacity will handle additional flow. Additional analysis required to determine if drainage system can handle additional 30% flow.	1, 3A, 7
Direct discharge to Jordan River	Jordan River	1000 West to 700 West	Outfall structure on south side of the road will need to be relocated if the roadway is widened to the south.	1, 3A, 4, 7
11400 South				
NA	NA	11400 South storm drain (Bangerter Highway to East Jordan Canal)	Need to install new storm drain system from Bangerter Highway to the East Jordan Canal.	1, 4, 7
Detention pond at 2700 West and 11400 South	11400 South storm drain (1300 West pond)	Bangerter Highway to 2700 West	Proposed detention pond 100yr-1hr storm / 1.3 ac-ft / 15 cfs* 10yr-24hr storm / 0.7 ac-ft / 15 cfs*	1, 4, 7
Detention pond at 1300 West and 11500 South	Midas Creek	2700 West to 1300 West	Proposed detention pond 100yr-1hr storm / 1.42 ac-ft / 20 cfs* 10yr-24hr storm / 0.71 ac-ft / 20 cfs* Proposed detention pond outlined in South Jordan Storm Drain Master Plan 100yr-1hr storm / 4.3 ac-ft / 1 cfs* 10yr-24hr storm / 2.7 ac-ft / 1 cfs*	1, 4, 7
Direct discharge to Midas Creek	Midas Creek	1300 West to 1200 West	Discharge will be less than 5 cfs.	1, 4, 7

**Table 4-19. (cont.)
Storm Drainage System**

Outfall Locations	Receiving Water	Segment Serviced	Comments	Alternatives Affected
Detention pond west of Jordan River at 11400 South	Jordan River	1200 West to 900 West (Jordan River)	Proposed detention pond 100yr-1hr storm / 0.5 ac-ft / 1 cfs* 10yr-24hr storm / 0.30 ac-ft / 1 cfs*	1, 4, 7
Detention pond east of Jordan River at 11400 South	Jordan River	700 West to 900 West (Jordan River)	Expand capacity of existing detention pond 100yr-1hr storm / 0.5 ac-ft / 1 cfs* 10yr-24hr storm / 0.25 ac-ft / 1 cfs*	1, 4, 7
Direct discharge west side of Willow Creek	Willow Creek	700 West to 600 West	Flow will be less than 5 cfs.	1, 4, 7
Detention pond on the east side of Willow Creek	Willow Creek	I-15 to 600 West, also includes Jordan Gateway from 11000 south to 11800 South	Proposed detention pond 100yr-1hr storm / 4.0 ac-ft / 35 cfs* 10yr-24hr storm / 2.1 ac-ft / 35 cfs*	1, 3A, 4, 7
Detention pond on the east side of Willow Creek	Willow Creek	I-15 to 600 West, also includes Jordan Gateway from 11000 south to 11800 South	Proposed detention pond 100yr-1hr storm / 4.0 ac-ft / 35 cfs* 10yr-24hr storm / 2.1 ac-ft / 35 cfs*	1, 3A, 4, 7
Detention pond on the east side of I-15	11400 South Storm Drain (Willow Creek pond)	200 East to I-15, also includes State Street from 11000 south to 11800 South, and 92 cfs from the East Jordan Canal	Proposed detention pond 100yr-1hr storm / 8.2 ac-ft / 25 cfs* 10yr-24hr storm / 7.7 ac-ft / 25 cfs*	1, 4, 7
12300 South / 12600 South				
NA	NA	12600 South storm drain (Bangerter Highway to 600 West)	Additional analysis required to determine if drainage system can handle additional 30% flow.	1, 3A

**Table 4-19. (cont.)
Storm Drainage System**

Outfall Locations	Receiving Water	Segment Serviced	Comments	Alternatives Affected
Detention pond at 3310 West and 12600 South	12600 South storm drain	Bangerter Highway to 3300 West	Need to increase the pond capacity by approximately 30%.	1, 3A
Detention pond at 2390 West and 12600 South	Utah and Salt Lake Canal (initial 15-cfs of flow) 12600 South storm drain (remain flow)	3300 West to 2400 West	Also picks up discharge released from pond at 3310 West. Need to increase the pond capacity by approximately 30%.	1, 3A
Detention pond at 1585 West and 12600 South	12600 South storm drain	2400 West to 1600 West	Also picks up discharge released from pond at 2390 West and 11 cfs from the South Jordan Canal. Need to increase the pond capacity by approximately 30%.	1, 3A
Direct discharge to west side of Jordan River at 12300 South	Jordan River	12600 South storm drain system	Initial flows are routed through an oil-water separator prior to discharge into the Jordan River.	1, 3A
Detention pond on the east side of the Jordan River at 12300 South	Jordan River	Willow Creek (600 West) to the Jordan River.	Need to increase pond capacity by approximately 30%.	1, 3A
Direct discharge to Willow Creek at 12300 South	Willow Creek	I-15 to Willow Creek (600 West)	Initial flows are routed through an oil-water separator prior to discharge into Willow Creek.	1, 3A
Jordan Gateway / Lone Peak Parkway				
Direct discharge to Jordan River at 10600 South	Jordan River	10600 South to 10800 South	Discharge increased by 1.0 cfs.	1, 3A, 4, 7
Detention pond at about 11050 South and 750 West	Jordan River	10800 South to 11000 South	Need to increase pond by 0.16 ac-ft.	3A, 7

**Table 4-19. (cont.)
Storm Drainage System**

Outfall Locations	Receiving Water	Segment Serviced	Comments	Alternatives Affected
Detention pond on the east side of Willow Creek (This pond is also listed under 11400 South Corridor)	Willow Creek	11000 South to 11800 South	Proposed detention pond 100yr-1hr storm / 4.0 ac-ft / 35 cfs* 10yr-24hr storm / 2.1 ac-ft / 35 cfs*	1, 3A, 4, 7
Direct discharge to Willow Creek at 2 locations	Willow Creek	11800 South to 12300 South	Peak flow will increase by approximately 30%. Additional analysis required to determined if drainage capacity is sufficient.	3A, 7
State Street				
Detention Pond at 12100 South west of I-15	Willow Creek	11400 South to 12300 South	Need to increase pond capacity by approximately 30%.	1

* Values represent the Design Storm Event / the Volume of Required Storage for Storm Event / the Peak Discharge from Detention Pond
ac-ft = acre-feet ; cfs = cubic feet per second; hr = hour; % = percent

4.8.2 Groundwater

No Build Alternative

The No Build Alternative would have no new impacts to groundwater.

Alternative 1

There would be no anticipated impacts to the groundwater aquifers in the study area due to the construction of Alternative 1. If groundwater is encountered during construction in areas of known soil contamination, DWQ would be contacted and efforts would be taken to prevent the mixing of contaminated soil and groundwater.

Groundwater recharge would decrease once construction is complete, however, due to more surface water flowing over newly

paved areas into storm drainage systems. This decrease is not expected to be significant.

Alternative 3A

There would be no anticipated impacts to the groundwater aquifers in the study area due to the construction of Alternative 3A. If groundwater is encountered during construction in areas of known soil contamination, DWQ would be contacted and efforts would be taken to prevent the mixing of contaminated soil and groundwater.

Groundwater recharge would decrease once construction is complete, however, due to more surface water flowing over newly paved areas into storm drainage systems. This decrease is not expected to be significant.

Alternative 4

There would be no anticipated impacts to the groundwater aquifers in the study area due to the construction of Alternative 4. If groundwater is encountered during construction in areas of known soil contamination, DWQ would be contacted and efforts would be taken to prevent the mixing of contaminated soil and groundwater.

Groundwater recharge would decrease once construction is complete, however, due to more surface water flowing over newly paved areas into storm drainage systems. This decrease is not expected to be significant.

Alternative 7

There would be no anticipated impacts to the groundwater aquifers in the study area due to the construction of Alternative 7. If groundwater is encountered during construction in areas of known soil contamination, DWQ would be contacted and efforts would be taken to prevent the mixing of contaminated soil and groundwater.

Groundwater recharge would decrease once construction is complete, however, due to more surface water flowing over newly paved areas into storm drainage systems. This decrease is not expected to be significant.

4.8.3 Floodplain Impacts

As stated in Executive Order 11988 – Floodplain Management, “Each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for (1) acquiring, managing, and disposing of Federal lands, and facilities; (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.”

The Executive Order also states, “...each agency has a responsibility to evaluate the potential effects of any actions it may take in a floodplain; to ensure that its planning programs and budget request reflect consideration of flood hazards and floodplain management; and to prescribe procedures to implement the policies and requirements of the Order...”

In addition to Executive Order 11988, the Federal Regulations at 23 CFR 650, Subpart A - *Location and Hydraulic Design of Encroachments on Flood Plains* require that a location hydraulic study be performed if the proposed action will encroach upon the 100-year floodplain. To evaluate the floodplain impacts and to comply with Executive Order 11988 and 23 CFR 650, a location hydraulic study was performed. This study focused on identifying areas within existing natural stream channels that are being encroached upon or modified by the proposed improvements associated with the selected project alternatives. The floodplain analysis summarizes the impacts to floodplains at locations where the proposed roadway modifications encroach or impact an identified waterway.

All of the bridge configuration options investigated as part of the Hydraulics Study resulted in less than 1 foot of increase to the 100-year floodplain water surface elevation, which can be characterized as a minor impact. Regardless, Federal Emergency Management Agency (FEMA) coordination and permitting will be required since the bridge options encroach into the Jordan River’s regulatory floodway. All bridge options had bridge piers and abutments located within FEMA’s regulatory floodway. The following discussion summarizes the hydraulic study, which is included in its entirety as Appendix E.

No Build Alternative

Under the No Build Alternative, there would be no change to the floodplains specifically related to this project.

Alternative 1

Alternative 1 would result in floodplain encroachments at:

- Three locations on the Jordan River (10600 South, 11400 South, and at 12600 South);
- Two locations on Willow Creek (11400 South and 12600 South); and
- One location on Midas Creek (11400 South).

Encroachments associated with 10600 South and 12600 South would occur as a result of widening the existing roadway, however, these encroachments would be negligible. Widening the existing bridges over the Jordan River at 10600 South and 12600 South would have a negligible impact on upstream flooding elevations.

Encroachments associated with 11400 South would be the result of the new roadway crossing and improvements to the existing sections of 11400 South. The new Jordan River crossing would result in up to approximately 0.5 foot increased flooding elevations upstream of the proposed bridge (see Appendix E for estimated increases and a plan view graphic). The extent of encroachment would be dependent on the final roadway configuration and design.

Alternative 3A

Alternative 3A would result in floodplain encroachments at:

- Two locations on the Jordan River (10600 South and 12600 South); and
- One location on Willow Creek (12600 South).

Encroachments associated with 10600 South and 12600 South would occur as a result of widening the existing roadway, however, these encroachments would be negligible. Widening of the existing bridges over the Jordan River at 10600 and 12600

South would have negligible impact on upstream flooding elevations.

Alternative 4

Alternative 4 would result in floodplain encroachments at:

- Two locations on the Jordan River (11400 South and 10600 South);
- One location on Willow Creek (11400 South); and
- One location on Midas Creek (11400 South).

Encroachments associated with 10600 South would occur as a result of widening the existing roadway, but would be negligible. This alternative includes a new Jordan River crossing at 11400 South that results in increased flooding elevations upstream of the proposed bridge of up to approximately 0.5 foot.

Alternative 7

Alternative 7 would result in floodplain encroachments at:

- Two locations on the Jordan River (11400 South and 10600 South);
- One location on Willow Creek (11400 South); and
- One location on Midas Creek (11400 South).

Encroachments associated with 10600 South would occur as a result of widening the existing roadway, but would be negligible. This alternative includes a new Jordan River crossing at 11400 South that results in increased flooding elevations upstream of the proposed bridge of up to approximately 0.5 foot.

4.8.3.1 Mitigation Measures for Floodplain Impacts

Floodplain impacts may be minimized or eliminated during the project's design phase. As encroachments into the floodplains or natural channels are identified, the project design team will evaluate design options that meet project design requirements and reduce the project's impact on floodplains. All of the bridge

configuration options investigated as part of the Hydraulics Study (Appendix E) resulted in less than 1 foot of increase to the 100-year floodplain water surface elevation, which can be characterized as a minor impact. Regardless, Federal Emergency Management Agency (FEMA) coordination and permitting will be required since the bridge options encroach into the Jordan River's regulatory floodway.

All options had bridge piers and abutments located within FEMA's regulatory floodway. Structure crossings will be sized to meet UDOT drainage criteria, FEMA requirements outlined in 44 CFR, and any additional requirements outlined in 23 CFR 650. A 1-foot maximum rise in water surface elevation for the 1 percent chance flood is allowed by all of these requirements; however, prudent design may dictate a lesser rise. In cases where these requirements cannot be met, a formalized Conditional Letter of Map Revision and Letter of Map Revision would be required by FEMA.

4.9 Direct and Indirect Wetland Impacts

Impacts to wetlands and other waters were assessed both quantitatively and qualitatively, and are discussed in terms of permanent and temporary impacts. Permanent impacts include those wetlands and other waters that would be destroyed or their function permanently altered as a result of the project. These impacts can be direct or indirect. Temporary impacts include those wetlands and/or other waters that would experience temporary modification of functions, but that would be returned to their pre-construction (or better) condition after construction.

4.9.1 Direct Impacts

Generally, direct impacts would be the result of earthwork, including cut and fill areas for the roadway, and the installation of concrete, riprap, or other materials. These impacts are quantifiable and are discussed below.

Based on conceptual roadway design plans, the quantitative analysis for direct impacts involved using an assumed highway configuration and disturbance limits (based on slope gradients) for each alternative. Limits of disturbance were derived by "overlying" the assumed roadway configuration (including cut/fill areas and other earthwork) on the wetlands and other waters figure (Figure 3-6 in Section 3). The results are presented in Tables 4-20 and 4-21, and the impacts specific to each of the alternatives are discussed in the description of the impacts for that alternative.

Table 4-20.
Permanent Impacts to Wetlands

<u>Habitat Type</u> ¹	Impacts by Alternative (acres)				
	No Build	Alt 1	Alt 3A	Alt 4	Alt 7
Jurisdictional Wetlands					
<i>Natural Wetlands</i>					
Jordan River Wetlands	0	0.14	<0.01	0.14	0.14
Willow Creek Wetlands	0	0.12	0.01	0.11	0.11
Midas Creek Wetlands	0	0.01	0	0.01	0.01
Subtotal	0	0.28	0.01	0.26	0.26
Non-Jurisdictional Wetlands					
<i>Irrigation-Related Wetlands</i>					
Utah Lake Distributing Canal	0	0.03	0.03	<0.01	<0.01
Utah and Salt Lake Canal	0	0.03	0.02	0.01	0.02
South Jordan Canal	0	0.01	<0.01	0.01	0.01
Jordan and Salt Lake Canal	0	0.02	0.05	0.21	0.07
Beckstead Ditch		0.24	0.24	0	0.24
Various Unnamed Ditches	0	0.06	0.01	0.07	0.03
Subtotal	0	0.40	0.35	0.30	0.38
Total	0	0.68	0.37	0.57	0.64

¹Any wetlands discussed in Section 3 that are not included in this table are not impacted by any of the alternatives.

Table 4-21.
Permanent Impacts to Other Waters by Alternative

Resource ¹	Permanent Impacts by Alternative (feet)				
	No Build	Alt 1	Alt 3A	Alt 4	Alt 7
Jurisdictional Other Waters – Direct Impacts					
Jordan River	0	0	0	0	0
Willow Creek	0	280	0	200	200
Midas Creek		20	0	20	20
Subtotal	0	300	0	220	220
Non-Jurisdictional Other Waters – Direct Impacts					
Utah Lake Distributing Canal	0	140	100	40	40
Utah and Salt Lake Canal	0	240	200	40	40
South Jordan Canal	0	130	90	60	60
Jordan and Salt Lake Canal	0	90	0	280	90
Subtotal	0	600	390	420	230
Total	0	900	390	640	450

¹Any other waters discussed in Section 3 that are not included in this table are not impacted by any of the alternatives.

4.9.2 Indirect Impacts

Indirect permanent impacts to wetlands include sedimentation, erosion, noxious weed invasion, constriction of the active floodplain, and the loss of vegetation due to shadowing from a bridge. In addition, there may be additional wetlands loss due to indirect commercial development resulting from the Build Alternatives. Although the study area cities expect eventual development of these areas in the future, the type and rate of development would be increased under several of the Build Alternatives.

All indirect impacts from induced commercial growth are to non-jurisdictional wetlands and include wetlands associated with the Jordan and Salt Lake Canal, and a roadside ditch. Indirect development near 11400 South and I-15 would impact

approximately 0.8 acre of non-jurisdictional wetlands due to implementing Alternatives 1 and 7 and approximately 0.6 acre of non-jurisdictional wetlands due to implementing Alternative 4. Alternative 4 would have fewer indirect impacts than Alternatives 1 and 7 because of the direct impacts already associated with the interchange construction in this area. No wetlands impacts are expected from induced development near 11400 South and Redwood Road under Alternatives 1, 4, and 7. No indirect wetlands impacts from induced development are expected under Alternative 3A or the No Build Alternative.

Impacts to wetlands from erosion would typically be most pronounced in those wetlands along the roadway edge where there is increased flow frequency, volume, and velocity due to the increase in impermeable surface in the immediate area. Sedimentation impacts would be most pronounced in areas that receive and retain/detain surface runoff for longer periods of time.

Although noxious weed invasions typically occur in areas of exposed soil with full or partial sun, some noxious weeds are known to invade well-vegetated areas. In general, construction activities can provide a long-term vector for noxious weed invasion by exposing large areas of soil and by transporting various kinds of materials that may contain weed seeds. Although there are few noxious weed species that regularly occur within wetland areas, some species, such as Canada thistle, are commonly found along the perimeter of wetlands. Additionally, areas of exposed soil in nearby non-wetlands could be invaded and could provide an additional seed source for an invasion in wetland locations.

Although much of the Jordan River floodplain has been previously impacted by agriculture, residential and commercial development, and other activities, the placement of a new roadway across the floodplain may result in additional indirect impacts to the environment (including wetlands). These indirect impacts would mostly be the result of further constriction of the river (from the newly constructed bridge and associated embankment) and would

be most noticeable during high-flow events. This constriction, or loss of migration across the floodplain, may result in increased down cutting of the channel, higher velocity flood flows, lack of riparian woodland regeneration, and the potential for increased flood damage in some areas previously not affected by high flows.

The loss of wetland vegetation as a result of bridge shadowing is dependent on the orientation (east-west versus north-south), height, and width of the bridge. The most pronounced loss of vegetation as a result of shadowing is from low, wide bridges oriented in an east-west direction.

If new development occurs within the study area as an indirect effect of improved access due to one of the Build Alternatives, existing wetlands may be impacted. The severity of potential impacts to wetlands is unpredictable, and it is unclear if these impacts to wetlands would be mitigated.

4.9.3 Temporary Impacts

These impacts are common to all Build Alternatives and are briefly discussed below. Most of the temporary impacts to wetlands and other waters are associated with construction activities, including removing vegetation, exposing soil (potentially resulting in sedimentation, erosion, and noxious weed invasion), constructing access roads, and placing of silt fence or other temporary erosion control structures. These impacts would be relatively minor and localized, and affected areas would be restored to the original conditions (or better) after construction. All areas of temporary disturbance are presented in Table 4-22 and were estimated by adding a 10-foot-wide buffer to all areas of permanent disturbance.

Table 4-22.
Temporary Impacts to Wetlands by Alternative

<u>Habitat Type</u> ¹	Impacts by Alternative (acres)				
	No Build	Alt 1	Alt 3A	Alt 4	Alt 7
Jurisdictional Wetlands					
<i>Natural Wetlands</i>					
Jordan River Wetlands	0	0.03	<0.01	0.03	0.03
Willow Creek Wetlands	0	0.01	<0.01	0.01	<0.01
Midas Creek Wetlands	0	0.01	0	0.01	<0.01
Subtotal	0	0.05	<0.01	0.05	0.05
Non-Jurisdictional Wetlands					
<i>Irrigation-Related Wetlands</i>					
Utah Lake Distributing Canal	0	0.01	0.01	<0.01	<0.01
Utah and Salt Lake Canal	0	0.01	<0.01	<0.01	<0.01
South Jordan Canal	0	0.01	<0.01	<0.01	<0.01
Jordan and Salt Lake Canal	0	<0.01	0.01	<0.01	0.02
Beckstead Ditch	0	0	0	0	0
Various Unnamed Ditches	0	0.07	0.04	<0.01	0.01
Subtotal	0	0.10	0.07	0.02	0.05
Total	0	0.15	0.07	0.07	0.09

¹Any wetlands discussed in Section 3 that are not included in this table are not impacted by any of the alternatives.

4.9.4 Impacts by Alternative

Most of the indirect permanent impacts and temporary impacts are common to all Build Alternatives and are discussed above. Direct permanent impacts specific to each of the alternatives are discussed below.

No Build Alternative

There will be no impacts to wetlands or other waters resulting from the No Build Alternative.

Alternative 1

Permanent impacts to wetlands for Alternative 1 would be relatively minimal, and easily mitigated. This alternative would impact approximately 0.68 acre of wetland and 900 linear feet of other water at 13 different sites (Tables 4-20 and 4-21). These impacts include 0.28 acre of impact to jurisdictional wetlands and 300 linear feet of impact to jurisdictional other waters. Based on this level of impact to jurisdictional waters of the United States, the Corps has indicated that this alternative would require a Nationwide §404 Permit prior to construction. Impacts to the different components of the aquatic environment are discussed below.

Jurisdictional Wetlands

Alternative 1 includes the direct permanent impact of approximately 0.14 acre of wetlands associated with the Jordan River, 0.12 acre to wetlands associated with Willow Creek, and 0.01 acre to wetlands associated with Midas Creek (Table 4-20). All of these wetlands are considered jurisdictional.

The majority of the impacts to the Jordan River wetlands are associated with the proposed 11400 South crossing, while less than 0.01 acre is associated with the 12300 South crossing. Nearly all of the impact associated with the 11400 South crossing is a result of the shading from the new bridge, with some minor impacts from the abutments and piers.

The 0.12 acre of impact to the Willow Creek wetlands would be the result of the placement of fill for the new roadway. The creek would not be bridged and the majority of the impacts would be on the southern side of the existing 11400 South alignment, since a retaining wall would be placed on the north side.

The impacts to Midas Creek and the unnamed ditch wetlands would be the result of the placement of fill for the new roadway along 11400 South.

Non-Jurisdictional Wetlands

Alternative 1 includes the permanent impact of 0.40 acre of irrigation/stormwater-related wetlands (Table 4-20). All of these wetlands are considered non-jurisdictional. The direct permanent impacts to these wetlands are the result of impacting four irrigation canals, Beckstead Ditch, and various other unnamed irrigation ditches. All of these impacts are the result of the placement of fill for the widening of the existing 11400 South, 10600 South, and 12300 South corridors.

Other Waters

Alternative 1 would result in direct permanent impacts to approximately 900 linear feet of other waters. This includes impacts to 280 feet of the jurisdictional Willow Creek, 20 feet of the jurisdictional Midas Creek, and 600 feet of the non-jurisdictional canals (Table 4-21). All of these waterways would be diverted into new or extended culverts under the widened 11400 South, 10600 South, and 12300 South roadways.

Alternative 3A

Permanent impacts to wetlands for Alternative 3A would be minimal and easily mitigated. The alternative would impact 0.37 acre of wetlands and 390 linear feet of other waters at six different sites (Tables 4-20 and 4-21). Only 0.01 acre of impact are to jurisdictional wetlands. Based on this level of impact to jurisdictional waters of the United States, the Corps has indicated that this alternative would likely require a Nationwide §404 Permit prior to construction. Impacts to the different components of the aquatic environment are discussed below.

Jurisdictional Wetlands

Impacts to jurisdictional wetlands are split between Jordan River wetlands (<0.01 acre) and Willow Creek wetlands (0.01 acre). Most of the Jordan River wetland impacts and all of the Willow Creek wetland impacts occur at 12300 South. All these wetlands are considered jurisdictional.

Non-Jurisdictional Wetlands

Alternative 3A includes the direct permanent impact of 0.35 acre of irrigation/stormwater-related wetlands (Table 4-20). All of these wetlands are considered non-jurisdictional. The permanent impacts to these wetlands are the result of impacting three irrigation canals, Beckstead Ditch, and various other unnamed ditches. All of these impacts are the result of the placement of fill for widening the existing 10600 South and 12600 South corridors.

Other Waters

Alternative 3A would result in direct permanent impacts to approximately 390 linear feet of three non-jurisdictional canals (Table 4-21). All of these waterways would be placed into new or extended culverts under the widened 10600 South and 12300 South roadways. There would be no impacts to any jurisdictional other waters.

Alternative 4

Permanent impacts to wetlands for Alternative 4 would be minimal and easily mitigated. This alternative would impact 0.57 acre of wetlands and 640 linear feet of other waters at eight different sites (Tables 4-20 and 4-21). Approximately 0.26 acre of jurisdictional wetlands would be impacted. Based on this level of impact to jurisdictional waters of the United States, the Corps has indicated that this alternative would likely require a Nationwide §404 Permit prior to construction. Impacts to the different components of the aquatic environment are discussed below.

Jurisdictional Wetlands

Alternative 4 includes the direct permanent impact of approximately 0.14 acre of wetlands associated with the Jordan River, 0.11 acre to wetlands associated with Willow Creek, and 0.01 acre to wetlands associated with Midas Creek (Table 4-20). All of these wetlands are considered jurisdictional.

Non-Jurisdictional Wetlands

Alternative 4 includes the permanent impact of 0.30 acre of irrigation/stormwater-related wetlands (Table 4-20). All of these wetlands are considered non-jurisdictional. The direct permanent impacts to these wetlands are the result of impacting four irrigation canals and various other unnamed irrigation ditches. All of these impacts are the result of the placement of fill for the widening of the 11400 South corridor.

Other Waters

Alternative 4 would result in permanent impacts to approximately 640 linear feet of other waters. This includes impacts to 200 feet of the jurisdictional Willow Creek, 20 feet of the jurisdictional Midas Creek, and 420 feet of the non-jurisdictional canals (Table 4-21). All of these waterways would be placed into new or extended culverts under the widened 11400 South and 10600 South roadways.

Alternative 7

Permanent impacts to wetlands for Alternative 7 would be minimal and easily mitigated. This alternative would impact 0.64 acre of wetlands and 450 linear feet of other waters and seven different sites (Tables 4-20 and 4-21). Approximately 0.26 acre of jurisdictional wetlands would be impacted. Based on this level of impact to jurisdictional waters of the United States, the Corps has indicated that this alternative would likely require a Nationwide §404 Permit prior to construction. Impacts to the different components of the aquatic environment are discussed below.

Jurisdictional Wetlands

Alternative 7 would have the same impacts to jurisdictional wetlands as Alternative 4.

Non-Jurisdictional Wetlands

Alternative 7 includes the permanent impact of 0.38 acre of irrigation/stormwater-related wetlands (Table 4-20). All of these wetlands are considered non-jurisdictional. The direct permanent impacts to these wetlands are the result of impacting four irrigation canals, Beckstead Ditch, and various other unnamed irrigation ditches. All of these impacts are the result of the placement of fill for the widening of the existing 11400 South and 10600 South.

Other Waters

Alternative 7 would result in permanent impacts to approximately 450 linear feet of other waters. This includes impacts to 200 feet of the jurisdictional Willow Creek, 20 feet of the jurisdictional Midas Creek and 230 feet of the non-jurisdictional canals (Table 4-21). All of these waterways would be placed into new or extended culverts under the widened 11400 South and 10600 South roadways.

4.9.5 Section 404 (b)(1) Guidelines Analysis

As previously discussed, the Corps has indicated that based on the minimal anticipated adverse effects to jurisdictional wetlands and other waters associated with any of the Build Alternatives, it is expected that each would be permitted pursuant to one or more Nationwide §404 Permits. For projects permitted under Nationwide Permits, a project-specific 404(b)(1) analysis is not required because the analysis is done in connection with adoption of the Nationwide permit itself (see 33 CFR 330.5(b)(3) and 40 CFR 230.7).

4.9.6 Mitigation Measures

All impacted wetlands and other waters will be mitigated in accordance with current UDOT, FHWA, and Corps wetland mitigation policy and the conditions of the Corps §404 Nationwide Permit. All mitigation plans will be developed in coordination with the Corps and other appropriate agencies during the §404 permitting process.

The wetlands impacted by any of the Build Alternatives are expected to be replaced at UDOT's wetland mitigation bank. The location of the mitigation bank, south of the study area near the Jordan River, has been approved by the mitigation bank review team. The 15 acres of property was purchased in 2001 by UDOT as mitigation for wetland and secondary wildlife impacts, as permitted in Corps Permit #199950550. Special Condition 5 of the permit states, "Two other proposed projects that similarly would impact the Jordan River (improvements to 12300 South and the proposed 11400 S road and crossing of the Jordan River) may qualify for mitigation within the fifteen acres in the event the Corps of Engineers issues permits for those two projects."

Representatives from the Corps, USFWS, UDWR, Utah Division of Water Rights, EPA, and FFSL serve on the mitigation bank review team. During the Section 404 permitting process for this project, the amount of the 15-acre property to be used as mitigation for this project will be determined by the review team.

Additional Mitigation Measures

In addition to compensatory mitigation, the following mitigation measures would be employed to minimize adverse impacts to wetlands and other waters during project construction:

- Unnecessary temporary impacts would be avoided by fencing the limits of disturbance through wetland areas prior to construction;

- Best Management Practices (BMPs) would be used during all phases of construction to reduce impacts from sedimentation and erosion, including the use of check dams, silt fence, slope drains, drop-inlet barriers, sediment traps, berms, and/or curb inlet barriers;
- No equipment staging or storage of construction materials would occur within 50 feet of wetlands or other waters;
- The use of chemicals, such as soil stabilizers, dust inhibitors, and fertilizers within 50 feet of wetlands and other waters would be prohibited;
- Equipment would be refueled in designated contained areas, at least 50 feet away from wetlands and other waters;
- Where practicable, work would be performed during low flows or dry periods and if flowing water is present it would be diverted around active construction areas;
- No discharge of effluent into wetlands or other waters would occur;
- Temporary fill material would not be stored within wetlands or other waters;
- Any wetland areas used for construction access would be covered with a layer of geotextile, straw and soil prior to use;
- Any new or modified bridges over the Jordan River would be designed to prevent any direct discharge of stormwater runoff into wetlands; and
- The location and design of any temporary crossing of the river would be approved by UDOT environmental staff.

4.10 Direct and Indirect Wildlife Impacts

This Section describes how each alternative would impact wildlife, including wildlife and fisheries, and special status species.

4.10.1 Wildlife and Fisheries

This section addresses impacts to wildlife resulting from each alternative. Construction of any of the Build Alternatives may impact wildlife through:

- Mortality;
- Habitat loss;
- Habitat fragmentation; and/or
- Displacement during construction

Impacts to fisheries for all alternatives would be minor. As discussed in Section 3.10, fish habitat throughout the study area is largely degraded. Surviving fish species are few and scattered. The study area does not constitute a prime fishery resource. Water quality, although currently degraded, could be impacted through construction activity; however, as discussed in Section 4.9, would be limited by applying appropriate construction techniques and BMPs.

The analysis of impacts to Threatened and Endangered Species for the Build Alternatives was submitted to USFWS for their review and concurrence (see Appendix D – December 3, 2003 letter from UDOT to USFWS). The USFWS has concurred with a “not likely to adversely affect” determination for the bald eagle and a “no effect” determination for other listed species (Appendix D – December 12, 2003 letter from USFWS).

The nature of wildlife impacts is similar for all Build Alternatives and are discussed below. Any alternative-specific impacts are discussed later under each alternative.

Mortality

Mortality impacts to wildlife could occur during construction activities or during the operation of the roadway and associated roadway features and is largely limited to terrestrial species. Construction-related mortality is generally associated with

equipment crushing individual animals during earthmoving and other related activities. This type of mortality is generally most pronounced for small mammals, reptiles and amphibians, since they are generally less mobile than larger mammals and birds. However, the eggs and young of birds (including raptors) are particularly susceptible to mortality from nest destruction during the nesting season.

The mortality of wildlife during operation of the roadway is mostly associated with vehicle/wildlife collisions, although there could be additional mortality of birds associated with roadway lighting and poor water quality associated with stormwater detention ponds. Migrating birds are attracted to light beams pointed upward or out, particularly during inclement weather conditions, and can become trapped in them. Once inside a beam of light, birds are reluctant to fly out of the lighted area into the dark, and often drop to the ground with exhaustion. An exhausted bird on the ground is vulnerable to predation and mortality from a collision with a vehicle (FLAP 2004).

During various meetings with the public and regulatory agencies, concerns regarding the potential impacts to waterfowl from poor water quality associated with stormwater detention ponds was discussed. Although these ponds can provide excellent habitat for many wildlife species, they do collect and concentrate sediment, hydrocarbons, and other contaminants from roadway runoff. As discussed in Section 4.10.3, Mitigation Measures, the stormwater detention basins would be designed to inhibit wildlife use of areas of a detention basin at which contaminants might collect. Stormwater design basins would be regularly maintained to inhibit the accumulation of contaminants.

Habitat Loss

The loss of habitat can be temporary or permanent, and the impacts are similar for all Build Alternatives. Temporary habitat loss includes those areas that are adjacent to the areas of

permanent disturbance that would primarily be used for access during construction. These areas were estimated by using a 10-foot wide buffer around all areas of permanent disturbance. Although the existing vegetation would be cleared in areas of terrestrial habitat, it would be restored after construction. Aquatic habitats could also be temporarily impacted during construction due to decreased water quality caused by sedimentation.

The permanent loss of habitat would be the result of the installation of permanent roadway features, including the placement of fill, concrete, pavement, or other materials used in the construction or widening of roads, or the installation of other roadway features into both terrestrial and aquatic habitats.

Since wetland, riparian/urban forest, and open water habitats are the only “natural” or relatively undisturbed areas present in the impact area, they are the only habitats included in the discussion of habitat loss. While these may be important havens for common wildlife species, no critical habitat has been identified in the project study area. The other habitats in the project area consist of agricultural, pasture, or developed lands that may provide marginal habitat for various species but are generally of low quality.

The acreage of habitats permanently lost for construction under each alternative is presented in Table 4-23 and the text following the table describes the impacts specific to each alternative. The location of the riparian/urban forest habitat impacts are detailed further in Table 4-24.

Table 4-23.
Impacts to Wildlife Habitat by Alternative.

Resource ^{1, 2}	Permanent Impacts by Alternative (acres)				
	No Build	Alt 1	Alt 3A	Alt 4	Alt 7
Direct Impacts					
Riparian /Urban Forest	0	1.38	0.01	2.42	1.38
Wetland	0	0.68	0.37	0.57	0.64
Open Water	0	0.38	0.22	0.27	0.16
Total	0	2.69	0.33	3.54	2.20

¹Only wetlands, riparian/urban forest, and open water habitats were considered since other habitats in the project area are generally disturbed and of low quality

²Open water includes those areas that contain water for most of the year, including Willow Creek, Midas Creek and all irrigation canals. There would be no losses to open water associated with the Jordan River.

Table 4-24.
Impacts to Riparian/Urban Forest Habitat by Alternative.

Permanent Impacts by Alternative (acres)				
Location	Alt 1	Alt 3A	Alt 4	Alt 7
10400 S and Utah and Salt Lake Canal	0.01	0.01	N/A	0.01
West of South Jordan Canal	0.37	N/A	0.37	0.37
11400 S and South Jordan Canal	0.02	N/A	0.02	0.02
Midas Creek	0.03	N/A	0.03	0.03
11400 South and Jordan River	0.02	N/A	0.02	0.02
Willow Creek	0.34	N/A	0.34	0.34
11400 S and I-15 area	0.59	N/A	1.64	0.59
Total	1.38	0.01	2.42	1.38

Habitat Fragmentation

Impacts to wildlife from habitat fragmentation are associated with the destruction or modification of habitat, or the introduction of a

permanent disturbance into habitat that serves to divide large areas of continuous habitat (or movement corridors) into smaller disconnected areas. The nature of these impacts are similar for all Build Alternatives and a brief discussion of alternative-specific fragmentation impacts are discussed later under each alternative.

Displacement

Impacts to wildlife from noise and associated visual disturbances could result in the temporary displacement of some species during construction and the permanent displacement of some species during roadway operation. These impacts would be more pronounced with alternatives that include a new river crossing. The increased noise levels near the new bridge would contribute to wildlife displacement, but this is not expected to be significant.

As discussed in Section 4.8, noise from construction vehicles and equipment could reach 100 dB, whereas normal background noise levels are 60 to 80 dB. The intensity of noise impacts would decrease with increased distance from a construction zone and trees can provide some buffering capacity. High noise levels can cause behavioral and physiological reactions in wildlife that vary by species and individual (Knight and Gutzwiller 1995). This impact would be most pronounced in areas where new roads are being constructed (in previously undisturbed areas), whereas the widening of existing roads would have minimal impacts due to the existing presence of vehicular traffic. Because of the existing level of development in the project area, it is likely that most wildlife is habituated to some level of traffic and human-related disturbance, and therefore overall noise impacts would be minor.

Birds and raptors are especially vulnerable to disturbance during nesting. Sensitivity to a disturbance is dependent on the species, as well as an individual's tolerance, but generally an individual will temporarily flush from or permanently abandon a nest due to disturbance. Temporary absence from a nest could result in high nestling mortality from overheating, chilling, desiccation, or

premature fledging. Most raptors return to the same nest site or territory for consecutive years but may not return to their nesting territory the following season if it was disturbed the previous year (Romin and Muck 2002). No raptor nests were observed along the Jordan River; however, an active red-tailed hawk nest was observed (in May 2003) approximately 0.5 mile east of the Jordan River near 11500 South.

Indirect Impacts

Development occurring within the study area as a result of improved access due to any of the Build Alternatives may impact wildlife. Mortality, displacement, and habitat loss or degradation may occur during commercial or residential development construction activities and could potentially continue once construction is completed. Increased levels of noise and night lighting, as well as increased human activity could also have detrimental effects on wildlife in the area.

Impacts to wildlife habitat due to indirect commercial development may result from Alternatives 1, 4, and 7; however, as stated previously, no critical wildlife habitat has been identified within the project study area. Indirect development near 11400 South and I-15 may result in the removal of approximately 1.7 acres of riparian/urban forest habitat under Alternatives 1 and 7 and approximately 0.7 acre under Alternative 4. Alternative 4 would have fewer indirect impacts than Alternatives 1 and 7 because of the direct impacts already associated with the interchange construction in this area. Approximately 0.6 acres of riparian/urban forest habitat may be removed by indirect development near 11400 South and Redwood Road under Alternatives 1, 4, and 7. No indirect wildlife habitat impacts from induced development are expected under Alternative 3A or the No Build Alternative. However, the study area cities expect eventual development of these areas in the future, under any alternative scenario.

No Build Alternative

The No Build Alternative is not expected to cause any additional impacts to wildlife, as no road improvements would occur. Since existing wildlife is habituated to traffic along the existing roads, it is likely that wildlife habituation to traffic would continue. However, as discussed in the cumulative impacts section (Section 4.19), cumulative impacts to wildlife habitat would result under any alternative, including the No Build Alternative, due to all the previously planned development in and adjacent to the project study area.

Alternative 1

Alternative 1 is expected to result in minor permanent and temporary impacts to wildlife. The impacts are discussed in general terms above and in more detail below.

Mortality

The mortality of wildlife expected during construction of Alternative 1 would be relatively minor and restricted to species with limited mobility such as reptiles, burrowing animals, etc. Construction-related mortality impacts from this alternative would be greater than alternatives that do not include a new river crossing due to the additional habitat that would be disturbed. During operation of Alternative 1, wildlife mortality would be similar to that of other urban arterials.

Habitat Loss

This alternative would result in the permanent disturbance to 1.38 acres of riparian/urban forest habitat, 0.68 acre of wetland habitat, and 0.38 acre of open water. Additionally, it would result in the temporary disturbance of 0.27 acre of riparian/urban forest habitat and 0.15 acre of wetland habitat. Nearly all impacts to the riparian/urban forest habitats are a result of widening the existing 11400 South near the South Jordan Canal, Willow Creek, and I-

15, with some minor impacts along 10600 South and the Jordan River. Most of the wetland impacts are along the Jordan River.

Habitat Fragmentation

In theory, a new bridge and roadway over the Jordan River at 11400 South would contribute to the overall fragmentation of habitats by impeding the movement of wildlife. However, the bridge has been designed to be at least 10 feet high and to allow a minimum of 10 feet of natural substrate on each side of the ordinary flow channel (plus a paved pedestrian trail) for animals to pass under the structure. This would provide a movement corridor for animals of all sizes.

No new habitat fragmentation is expected along the Jordan River as a result of the widening of the existing 10400/10600 South and 12300/12600 South, since these crossings already exist.

However, the widening of 11400 South over Willow Creek and Midas Creek would present an increased impediment to wildlife movement due to the addition of fill (raising the existing ground surface) and the introduction of vehicular traffic.

Displacement

The impacts to wildlife from displacement associated with Alternative 1 would be most pronounced along the new portions of 11400 South due to the introduction of activities in an area that has been relatively undisturbed. If noise levels resulting from the river crossing cause displacement of wildlife, such wildlife would most likely migrate to other nearby habitat areas that will be improved through mitigation strategies identified in Section 4.10.3 below. Therefore, the potential dislocation of wildlife from project impacts would be absorbed within adjacent and improved habitat. The displacement of wildlife associated with the widening of the existing 11400 South, 10400/10600 South, and 12300/12600 South roadways would be minimal since vehicular traffic is already present in these areas.

Alternative 3A

Generally, this alternative is expected to result in minor permanent and temporary impacts to wildlife.

Mortality

The mortality of wildlife expected during construction of Alternative 1 would be relatively minor and restricted to species with limited mobility such as reptiles, burrowing animals, etc. Construction-related mortality impacts from this alternative would be less than for alternatives that include a new river crossing due to the reduced habitat that would be disturbed. During operation of Alternative 3A, wildlife mortality would be similar to that of other urban arterials.

Habitat Loss

This alternative would result in the permanent disturbance to 0.01 acre of riparian/urban forest habitat, 0.37 acre of wetland habitat, and 0.22 acre of open water. Additionally, it would result in the temporary disturbance of 0.01 acre of riparian/urban forest habitat and 0.07 acre of wetland habitat. All impacts to the riparian/urban forest habitats are a result of widening the existing 10600 South roadway near the Utah and Salt Lake Canal. Most of the wetland impacts are associated with the Jordan River and Willow Creek.

Habitat Fragmentation

No new habitat fragmentation is expected along the Jordan River associated with the widening of the existing 10400/10600 South and 12300/12600 South roadways, since these crossings already exist.

Displacement

The displacement of wildlife associated with the widening of the existing 10400/10600 South and 12300/12600 South roadways would be minimal, since vehicular traffic and other activities are already present in these areas.

Alternative 4

This alternative is expected to result in minor permanent and temporary impacts to wildlife.

Mortality

The mortality of wildlife expected during construction of Alternative 4 would be relatively minor and restricted to species with limited mobility such as reptiles, burrowing animals, etc. Construction-related mortality impacts from this alternative would be greater than alternatives that do not include a new river crossing due to the additional habitat that would be disturbed. During operation of Alternative 4, wildlife mortality would be similar to that of other urban arterials.

Habitat Loss

This alternative would result in the permanent disturbance to 2.42 acres of riparian/urban forest habitat, 0.57 acres of wetland habitat, and 0.27 acre of open water. Additionally, it would result in the temporary disturbance of 0.24 acre of riparian/urban forest habitat and 0.07 acre of wetland habitat. The impact to the habitat is similar to that for Alternative 1, except there is 1.04 additional acres of impact to riparian/urban forest habitat associated with the new Interchange at I-15.

Habitat Fragmentation

In theory, a new bridge and roadway over the Jordan River at 11400 South would contribute to the overall fragmentation of habitats by impeding the movement of wildlife. However, the bridge has been designed to be at least 10 feet high and to allow a minimum of 10 feet of natural substrate on each side of the ordinary flow channel (plus a paved pedestrian trail) for animals to pass under the structure. This would provide a movement corridor for animals of all sizes.

No new habitat fragmentation is expected along the Jordan River as a result of the widening of the existing 10400/10600 South,

since this crossing already exists. However, the widening of 11400 South over Willow Creek and Midas Creek would present an increased impediment to wildlife movement due to the addition of fill (raising the existing ground surface) and the introduction of vehicular traffic.

Displacement

The impacts to wildlife from displacement associated with Alternative 1 would be most pronounced along the new portions of 11400 South due to the introduction of activities in an area that has been relatively undisturbed. If noise levels resulting from the river crossing cause displacement of wildlife, such wildlife would most likely migrate to other nearby habitat areas that will be improved through mitigation strategies identified in Section 4.10.3 below. Therefore, the potential dislocation of wildlife from project impacts would be absorbed within adjacent and improved habitat. The displacement of wildlife associated with the widening of the existing 11400 South, and 10400/10600 South roadways would be minimal since vehicular traffic is already present in these areas.

Alternative 7

This alternative is expected to result in minor permanent and temporary impacts to wildlife.

Mortality

The mortality of wildlife expected during construction of Alternative 7 would be relatively minor and restricted to species with limited mobility such as reptiles, burrowing animals, etc. Construction-related mortality impacts from this alternative would be greater than alternatives that do not include a new river crossing due to the additional habitat that would be disturbed. During operation of Alternative 7, wildlife mortality would be similar to that of other urban arterials.

Habitat Loss

This alternative would result in the permanent disturbance to 1.38 acres of riparian/urban forest habitat, 0.64 acre of wetland habitat, and 0.16 acre of open water. Additionally, it would result in the temporary disturbance of 0.27 acre of riparian/urban forest habitat and 0.09 acre of wetland habitat. Nearly all impacts to the riparian/urban forest habitats are a result of widening the existing 11400 South near the South Jordan Canal, Willow Creek, and I-15, with some minor impacts along 10600 South. Most of the wetland impacts are along the Jordan River.

Habitat Fragmentation

In theory, a new bridge and roadway over the Jordan River at 11400 South would contribute to the overall fragmentation of habitats by impeding the movement of wildlife. However, the bridge has been designed to be at least 10 feet high and to allow a minimum of 10 feet of natural substrate on each side of the ordinary flow channel (plus a paved pedestrian trail) for animals to pass under the structure. This would provide a movement corridor for animals of all sizes.

No new habitat fragmentation is expected along the Jordan River as a result of the widening of the existing 10400/10600 South, since this crossing already exists. However, the widening of 11400 South over Willow Creek and Midas Creek would present an increased impediment to wildlife movement due to the addition of fill (raising the existing ground surface) and the introduction of vehicular traffic.

Displacement

The impacts to wildlife from displacement associated with Alternative 1 would be most pronounced along the new portions of 11400 South due to the introduction of activities in an area that has been relatively undisturbed. If noise levels resulting from the river crossing cause displacement of wildlife, such wildlife would most likely migrate to other nearby habitat areas that will be

improved through mitigation strategies identified in Section 4.10.3 below. Therefore, the potential dislocation of wildlife from project impacts would be absorbed within adjacent and improved habitat. The displacement of wildlife associated with the widening of the existing 11400 South, and 10400/10600 South roadways would be minimal since vehicular traffic is already present in these areas.

4.10.2 Special Status Species

The potential impacts to special status species (including threatened or endangered species) as a result of implementation of any of the alternatives are discussed in this section. Impacts were assessed only for those special status species potentially occurring in the study area, as described in Section 3, and are discussed by species under each alternative.

No Build Alternative

Under the No Build Alternative, no impacts resulting from this project would adversely affect special status species.

Alternative 1

As discussed in Section 4.10.1 Wildlife and Fisheries, Alternative 1 would result in 1.38 acres of permanent disturbance to riparian/urban forest habitat, 0.68 acre of wetland habitat, and 0.38 acre of open water habitat within the study area. New bridge crossings required for the continuation of 11400 South would result in permanent disturbance of wetland and riparian/urban forest habitat at the Jordan River and Willow Creek.

Bald Eagle

No bald eagle nests or roosts occur in the project area, however, foraging individuals are occasionally observed in the vicinity of the Jordan River within the study area during migration and winter (between November and March). There would be no affect to bald eagles from construction of this alternative. Only migrating or foraging individuals would be present and these individuals would likely avoid any construction areas.

Common Yellowthroat

Disturbance or loss of wetland and riparian/urban forest habitats within the study area would have a minimal affect on common yellowthroat populations. Bridge construction for 11400 South over the Jordan River and other activities at Willow Creek could cause a loss and/or fragmentation of habitat that may change distributions of common yellowthroats within the study area, but this is not likely to adversely affect populations in the area. Removal of vegetation from wetland or riparian/urban forest habitats during the nesting season (May 1 through August 31) could result in destruction of an active nest and loss of eggs or young (although no nests were observed during general wildlife field studies).

Blue Grosbeak

Impacts to blue grosbeaks under Alternative 1 would be similar to those described for common yellowthroat.

Western Burrowing Owl

While burrowing owls occur in the Salt Lake Valley, none were observed during May 2003 site visits. However, they may choose to nest in the area from time to time. Therefore, surveys for burrowing owls would be conducted prior to construction activities to determine presence during their breeding season (April 1 through October 31). Impacts to burrowing owls, if present, may include:

- Permanent loss of potential nesting and foraging habitat;
- Temporary displacement due to construction, including nest abandonment from burrows located adjacent to the current construction footprint; and
- Mortality from nest destruction.

Alternative 3A

Under Alternative 3A, 0.01 acre of riparian/urban forest habitat, 0.37 acre of wetland habitat, and 0.22 acre of open water would

be permanently removed. Temporary habitat impacts under Alternative 3A would be negligible.

Bald Eagle

No bald eagle nests or roosts occur in the project area, however, foraging individuals are occasionally observed in the vicinity of the Jordan River within the study area during migration and winter (between November and March). There would be no affect to bald eagles from construction of this alternative. Only migrating or foraging individuals would be present and these individuals would likely avoid any construction areas.

Common Yellowthroat

Disturbance or loss of wetland and riparian/urban forest habitats within the study area would have a minimal affect on common yellowthroat populations. Removal of vegetation from wetland or riparian/urban forest habitats during the nesting season (May 1 through August 31) could result in destruction of an active nest and loss of eggs or young (although no nests were observed during general wildlife field studies).

Blue Grosbeak

The impacts to blue grosbeaks would be similar to those described for common yellowthroat.

Burrowing Owl

While burrowing owls occur in the Salt Lake Valley, none were observed during May 2003 site visits. However, they may choose to nest in the area from time to time. Therefore, surveys for burrowing owls would be conducted prior to construction activities to determine presence during their breeding season (April 1 through October 31). Impacts to burrowing owls, if present, may include:

- Permanent loss of potential nesting and foraging habitat;

- Temporary displacement due to construction, including nest abandonment from burrows located adjacent to the current construction footprint; and
- Mortality from nest destruction.

Alternative 4

Alternative 4 would result in 2.42 acres of permanent disturbance to riparian/urban forest habitat, 0.57 acre of wetland habitat, and 0.27 acre of open water habitat within the study area. Impacts to riparian/urban forest and wetland habitat at the Jordan River and Willow Creek would be similar to Alternative 1. New bridge crossings required for the continuation of 11400 South would result in permanent disturbance of wetland and riparian/urban forest habitat at the Jordan River and Willow Creek.

Bald Eagle

No bald eagle nests or roosts occur in the project area, however, foraging individuals are occasionally observed in the vicinity of the Jordan River within the study area during migration and winter (between November and March). There would be no affect to bald eagles from construction of this alternative. Only migrating or foraging individuals would be present and these individuals would likely avoid any construction areas.

Common Yellowthroat

Disturbance or loss of wetland and riparian/urban forest habitats within the study area would have a minimal affect on common yellowthroat populations. Bridge construction for 11400 South over the Jordan River and other activities at Willow Creek could cause a loss and/or fragmentation of habitat that may change distributions of common yellowthroats within the study area, but this is not likely to adversely affect populations in the area. Removal of vegetation from wetland or riparian/urban forest habitats during the nesting season (May 1 through August 31) could result in destruction of an active nest and loss of eggs or

young (although no nests were observed during general wildlife field studies).

Blue Grosbeak

The impacts to blue grosbeaks would be similar to those described for common yellowthroat.

Burrowing Owl

While burrowing owls occur in the Salt Lake Valley, none were observed during May 2003 site visits. However, they may choose to nest in the area from time to time. Therefore, surveys for burrowing owls would be conducted prior to construction activities to determine presence during their breeding season (April 1 through October 31). Impacts to burrowing owls, if present, may include:

- Permanent loss of potential nesting and foraging habitat;
- Temporary displacement due to construction, including nest abandonment from burrows located adjacent to the current construction footprint; and
- Mortality from nest destruction.

Alternative 7

Alternative 7 would result in permanent impacts to 1.38 acres of riparian/urban forest habitat, 0.64 acres to wetland habitat, and 0.16 acre of open water habitat. Impacts to riparian/urban forest and wetland habitat at the Jordan River and Willow Creek would be similar to Alternative 1. New bridge crossings required for the continuation of 11400 South would result in permanent disturbance of wetland and riparian/urban forest habitat at the Jordan River and Willow Creek.

Bald Eagle

No bald eagle nests or roosts occur in the project area, however, foraging individuals are occasionally observed in the vicinity of the Jordan River within the study area during migration and winter

(between November and March). There would be no affect to bald eagles from construction of this alternative. Only migrating or foraging individuals would be present and these individuals would likely avoid any construction areas.

Common Yellowthroat

Disturbance or loss of wetland and riparian/urban forest habitats within the study area would have a minimal affect on common yellowthroat populations. Bridge construction for 11400 South over the Jordan River and other activities at Willow Creek could cause a loss and/or fragmentation of habitat that may change distributions of common yellowthroats within the study area, but this is not likely to adversely affect populations in the area.

Removal of vegetation from wetland or riparian/urban forest habitats during the nesting season (May 1 through August 31) could result in destruction of an active nest and loss of eggs or young (although no nests were observed during general wildlife field studies).

Blue Grosbeak

The impacts to blue grosbeaks would be similar to those described for common yellowthroat.

Burrowing Owl

The presence of burrowing owls in the project area is unknown. While burrowing owls occur in the Salt Lake Valley, none were observed during May 2003 site visits. However, they may choose to nest in the area from time to time. Therefore, surveys for burrowing owls would be conducted prior to construction activities to determine presence during their breeding season (April 1 through October 31). Impacts to burrowing owls, if present, may include:

- Permanent loss of potential nesting and foraging habitat;

- Temporary displacement due to construction, including nest abandonment from burrows located adjacent to the current construction footprint; and
- Mortality from nest destruction.

4.10.3 Mitigation Measures

The following mitigation measures have been considered for all Build Alternatives and would be implemented to benefit and enhance wildlife habitat, including special status species habitat. The extent/acreage of the mitigation would be determined following final design and construction.

- A revegetation plan would be developed for areas that would be temporarily disturbed during construction. The plan would address selection of appropriate plant species, soil preparation, seeding rates, and seeding methods. The revegetation plan would be reviewed by the UDOT Landscape Architect and UDWR;
- All areas temporarily disturbed during construction would be seeded or planted with native grasses, forbs, shrubs, and trees per the revegetation plan. Seeding would occur in the appropriate season; temporary seeding or mulching may also be required. All areas to be reseeded would be disked or tilled prior to planting and/or seeding;
- Areas of riparian/urban forest habitat removed for construction would be replaced or enhanced to compensate for the effects of habitat loss. The decision as to whether habitat will be replaced or enhanced will be determined upon final design and further consultation with USFWS and UDWR. Factors to consider may include: availability of additional lands, the condition of the existing habitat within and adjacent to the proposed corridor, and a cost/benefit analysis of the proposed action. Habitat replacement or enhancement would consist of planting native trees and shrubs, control of noxious weeds, seeding

of native species, or establishment of conservation easements on riparian/urban forest areas in the vicinity of the project. Habitat enhancement would be accomplished within the study area evaluated in this FEIS, ideally along the Jordan River;

- Habitat enhancements might also include installation of day and/or night roosting bat habitat on the pedestrian bridge. During final design, UDOT would coordinate with USFWS and UDWR personnel regarding the feasibility of including bat habitat enhancements;
- Arched pipes (up to 14 feet wide by 10 feet high) that include a natural substrate bottom would be installed for any expanded crossings of Willow Creek and Midas Creek to allow for better wildlife movement along these stream corridors;
- During construction, vehicle operation would be restricted to the designated construction area, which would be fenced or clearly flagged;
- Noxious weeds would be controlled during construction and operation in compliance with state and county requirements and UDOT BMPs; and
- BMPs would be used during all phases of construction to reduce impacts from sedimentation and erosion, including the use of check dams, silt fence, slope drains, drop-inlet barriers, sediment traps, berms, and/or curb inlet barriers.

Jordan River Bridge Crossing

- The bridge would be designed so that wildlife are provided adequate crossing space on each side of the Jordan River and shrubs and grasses would be planted at the entrances and underneath the bridge, as appropriate, to provide small animals cover when entering or passing through the bridge;

- Cottonwoods would be planted in the free-span area of the river crossing prior to construction to minimize light and noise impacts during construction activities; and
- Bridge lighting would be placed on the interior of the parapets and directed downward in order to keep light on the roadway and limit light escaping to the ambient environment, and to prevent birds from becoming trapped in the beam.

Migratory Birds

- Avoid construction during general nesting seasons to prevent destruction of active bird nests that would result in loss of eggs or live young. To comply with the MBTA, tree and shrub removal within the project area would occur during the non-nesting season;
- Avoid construction work on existing bridges on which active swallow nests exist to avoid disturbing nests and young. If construction would occur during the nesting season, nests must be removed prior to the nesting season so activities would not disturb active nests.

Nesting Raptors

Raptors respond differently to disturbance based on species, individual tolerance, nesting cycle, topography, and vegetative cover, as well as the type, frequency, and duration of disturbance (USFWS 2002). To minimize adverse impacts to nesting raptors in the project area:

- Conduct raptor nest survey prior to construction activity to determine presence of active nests; and
- Implement seasonal spatial buffer zones to avoid disturbance to nesting raptors. Consult with USFWS or UDWR to determine specific buffer distances and duration based on species and site characteristics.

Stormwater Detention Ponds

- Construct the basin such that wildlife would not utilize the water-storage area. Coordinate with USFWS and/or UDWR biologists on the final design of stormwater detention ponds.

Special Status Species

Common Yellowthroat and Blue Grosbeak

- Conduct Common Yellowthroat and Blue Grosbeak surveys to determine presence of birds; and
- If Common Yellowthroat or Blue Grosbeak individuals are found, consult UDWR in order to clear vegetation prior to the nesting season to discourage nesting in the construction area.

Burrowing Owl

- Conduct burrowing owl surveys to determine presence of the species in the construction ROW; and
- If burrowing owls are present, consult UDWR and implement seasonal buffer zones during the breeding season.

4.11 Impacts to Historical and Archaeological Resources

Impacts to cultural resources, which include both archaeological and historic resources, are evaluated on the basis of the potential for impacts to significant prehistoric and historic sites and to Native American Traditional Cultural Properties (TCPs). Prehistoric and historic sites and TCPs are considered significant if they are listed on or eligible for listing on the National Register of Historic Places (NRHP).

Impacts to significant cultural resources may occur as a result of several road construction-related activities. Direct impacts may result from road construction, staging areas, grading, and other excavation. Indirect impacts are defined as effects that are caused

by and result from the activity. Although indirect impacts may occur later in time or further removed in distance, they are still reasonably foreseeable.

Indirect

If it can reasonably be anticipated that a transportation project, once built, will cause or accelerate changes in land use or traffic patterns in other areas, these changes are also potential effects of the action. Indirect impacts to cultural resources may include the removal of additional historic structures due to new residential and commercial development, change in the character of a property's use or of physical features within the property's setting that contribute to its historic significance, and introduction of visual, atmospheric, or audible elements that diminish the integrity of a historic property's significant historic features. Other potential indirect impacts include, but are not necessarily limited to, surface collecting of sites and localities by the general public and long-term degradation as a result of improved public access into the project area.

Direct

The remainder of this section discusses direct impacts to cultural resources as a result of the No Build and the Build Alternatives.

4.11.1 Methodology

The Advisory Council on Historic Preservation (ACHP) has set procedures (36 CFR 800) to determine the effect a project may have on significant cultural resources and how to mitigate that effect if it is determined to be adverse. Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA), states that for federal undertakings, a cultural resources survey must be conducted to identify, inventory, and evaluate historic properties and other cultural resources for eligibility to the NRHP.

As part of the 11400 South EIS process, a records search was conducted to identify what corridors within the study area had been previously inventoried and to identify potentially eligible architectural and archaeological properties previously recorded

within the study area. Subsequent to the records search, a reconnaissance level cultural and paleontological resources survey of the remaining corridors that could be affected by the proposed action was conducted. The UGS has indicated that there are no known locations within the study area, nor are there likely to be any given the geologic setting. (see Appendix D – July 18 2003 letter from UGS). The cultural and historic findings are documented in the 11400 South EIS Project, Salt Lake County, Utah: Results of a Selective Reconnaissance Architectural Survey Report (URS 2004a) and the 11400 South EIS Project, Salt Lake County, Utah: Results of an Intensive Archaeological Survey Report (URS 2004b). The cultural resources reports were forwarded to the Utah State Historic Preservation Office (SHPO) for their review. SHPO has verbally concurred with the eligibility determinations. Coordination is ongoing between SHPO, UDOT, FHWA, and the Advisory Council on Historic Preservation (ACHP) representatives.

Section 106 also mandates that an evaluation be conducted on the potential effects the proposed action may have upon the cultural resources found within the project's area of potential effect (APE). *Effect* means alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register (36 CR 800.16). Impacts to cultural resources are categorized as *No Effect*, *No Adverse Effect*, and *Adverse Effect*.

As defined by 36 CFR 800.5:

An *Adverse Effect* is found “when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects

may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative.”

A finding of *No Adverse Effect* is applicable when “the undertaking's effects do not meet the criteria of paragraph (a)(1) of this section [Adverse Effect] or the undertaking is modified or conditions are imposed, such as the subsequent review of plans for rehabilitation by the SHPO/THPO to ensure consistency with the Secretary's standards for the treatment of historic properties (36 CFR part 68) and applicable guidelines, to avoid adverse effects.”

No Effect is defined as “either there are no historic properties present or there are historic properties present but the undertaking will have no effect upon them”.

UDOT and FHWA have consulted with the SHPO to prepare the Determination of Eligibility and Finding of Effect (DOE/FOE) for historic properties as presented in this FEIS. A copy of the signed DOE/FOE is included in Appendix D (September 22, 2004 letter from UDOT to SHPO, with SHPO approval received November 9, 2004).

Native American consultation to determine impacts to TCPs was conducted at the onset of this study and continued through the NEPA process. As with SHPO consultation, this consultation identified mitigation measures associated with the proposed project.

The boundaries drawn for the eligible properties are generally defined by the tax parcel. National Register Bulletin 16A (page 56) suggests that for urban and suburban properties, the legally recorded parcel number or lot lines are appropriate when those parcels retain their historic boundaries and integrity. National Register Bulletin 21 (page 3) states “Boundaries should include surrounding land that contributes to the significance of the resources by functioning as the setting... For example, do not limit the property to the footprint of the building, but include its yard or

grounds ...” Along many roads in the Salt Lake Valley, the tax parcel goes to the center of the street. Because the road and its associated features are there often by prescriptive use, the part of the private property under these transportation features does not retain integrity, and the boundary is drawn behind these features, generally behind the sidewalk.

The front yard of a residence represents the transitional zone between public and private use of space. Although many of the older homes in the study area were once part of larger farmsteads, these farms have been broken up and subdivided, especially post-WWII. The result is that for most of these properties, it is only the property now defined by the current tax parcel boundary that retains integrity. If there are outbuildings, landscape features, natural features, or other elements that contribute to conveying the property’s significance, boundaries are drawn as appropriate so that the historic use of the property and retention of elements of integrity related to that use are included. The property at 11450 South contains recent commercial buildings and the surrounding setting has been altered. For this structure, the historic boundary is the building itself.

4.11.2 Impacts by Alternative

The Build Alternatives would require either parcel takes or strip takes of a number of historic sites. If the required roadway ROW for a project would encroach within 15 feet of a property structure, UDOT typically purchases the entire property (parcel take). If the required ROW would be greater than 15 feet from a property structure, UDOT typically purchases a portion of the property and not the entire parcel (strip take).

If a historic property is not touched by a Build Alternative, there would be *No Effect*. For most of the historic resources affected by the Build Alternatives, a parcel take would be considered an *Adverse Effect* of the property, while a strip take would generally be considered *No Adverse Effect*. For the historic canals, if a roadway facility has already crossed at a given location, or if the

canal is piped at the crossing location, No Adverse Effect is assumed. A new canal crossing (such as the Galena Canal at 11400 South) is considered an Adverse Effect. Removal of the historic canal bridge at 200 West 11400 South would be considered an Adverse Effect on this historic site. For the historic railroad, because the segment located within the study area does not contribute to its eligibility, No Adverse Effect would occur from any of the Build Alternatives.

Table 4-25 summarizes the effect on each of the historic properties potentially impacted by any of the Build Alternatives. On the table, the “adverse effects” include parcel takes and the “no adverse effects” include strip takes. Alignment shifts or cross section reductions were incorporated into the Build Alternatives where possible to avoid the historic property. These alignment shifts and cross section reductions are discussed in Section 5.6, *Measures to Minimize Harm*.

4.11.3 Mitigation Measures

A Memorandum of Agreement (MOA) has been developed and signed by FHWA, UDOT, SHPO, and consulting parties for the Preferred Alternative. A copy of the signed MOA is included in the updates to Appendix B. Mitigation measures in the MOA include documenting adversely affected historic properties with full Intensive Level Surveys (ILS), marketing the adversely affected properties where determined marketable, salvaging architectural elements of affected properties prior to demolition, and providing for compensatory mitigation if marketing the structure is not feasible and prudent. If an alternative other than the Preferred Alternative is selected in the ROD, a new MOA that contains similar mitigation measures to address the specific resources affected by that alternative would be developed and signed prior to project construction. Any MOA would be coordinated with Draper, Riverton, Sandy and South Jordan cities, as applicable, to develop meaningful mitigation measures for the eligible properties that cannot be avoided.

Table 4-25. Historic Property Impacts by Alternative.

Address or Other Location	Alternative 1	Alternative 3A	Alternative 4	Alternative 7
1836 West 10400 South	No Effect	No Effect	No Effect	No Effect
1476 West 10400 South	No Adverse Effect	No Adverse Effect	No Effect	No Adverse Effect
1402 West 10400 South	No Effect	No Effect	No Effect	No Effect
1350 West South Jordan Parkway*	No Effect	No Effect	No Effect	No Effect
3244 West 11400 South	No Effect	No Effect	No Effect	No Effect
3113 West 11400 South	No Adverse Effect	No Effect	No Adverse Effect	No Adverse Effect
11323 South 2700 West	No Adverse Effect	No Effect	No Adverse Effect	No Adverse Effect
11395 South Redwood Road (aka 11389 South and 11367 South)*	No Adverse Effect	No Effect	No Adverse Effect	No Adverse Effect
11386 South 1300 West	No Adverse Effect	No Effect	No Adverse Effect	No Adverse Effect
11407 South 1300 West*	Adverse Effect (Parcel Take)	No Effect	Adverse Effect (Parcel Take)	Adverse Effect (Parcel Take)
1327 W 11400 S (aka 1323 W 11400 S)	No Adverse Effect	No Effect	No Adverse Effect	No Adverse Effect
11450 South 800 West (aka 11450 S 700 W)	No Adverse Effect	No Effect	No Adverse Effect	No Adverse Effect
455 West 11400 South (aka 437 W 11400 S)	No Effect	No Effect	No Effect	No Effect
434 West 11400 South	No Adverse Effect	No Effect	No Adverse Effect	No Adverse Effect
170-260 West 11400 South (Fairbourn Historic District)	Adverse Effect (Historic District/ Parcel Take)	No Adverse Effect (Historic District)	Adverse Effect (Historic District/ Parcel take)	Adverse Effect (Historic District/ Parcel Take)
12653 South 3600 West	No Effect	No Effect	No Effect	No Effect
2779 West 12600 South (commercial property)	Adverse Effect (Parcel Take)	Adverse Effect (Parcel Take)	No Effect	No Effect
2630 West 12600 South	No Effect	No Effect	No Effect	No Effect
2487 West 12600 South	No Effect	No Effect	No Effect	No Effect
2431 West 12600 South	No Effect	No Effect	No Effect	No Effect
2395 W 12600 S (aka 2295 W 12600 S)	No Effect	No Effect	No Effect	No Effect
2314 West 12600 South	No Effect	No Effect	No Effect	No Effect
1604 West 12600 South	No Effect	No Effect	No Effect	No Effect
1526 West 12600 South	No Effect	No Effect	No Effect	No Effect

**Table 4-25. (cont.)
Historic Property Impacts by Alternative**

Address or Other Location	Alternative 1	Alternative 3A	Alternative 4	Alternative 7
1512 West 12600 South	No Effect	No Effect	No Effect	No Effect
1396 West 12600 South**	No Effect	No Effect	No Effect	No Effect
736 West 12300 South	Adverse Effect (Parcel Take)	Adverse Effect (Parcel Take)	No Effect	No Effect
692 West 12300 South (aka 691 West 12300 South)	No Effect	No Effect	No Effect	No Effect
681 West 12300 South	No Effect	No Effect	No Effect	No Effect
675 West 12300 South	No Effect	No Effect	No Effect	No Effect
611 West 12300 South	No Effect	No Effect	No Effect	No Effect
390 West 12300 South (aka 438 West)	No Effect	No Effect	No Effect	No Effect
274 West 12300 South (aka 270 West 12300 South)	No Effect	No Effect	No Effect	No Effect
191 West 12300 South	Adverse Effect (Parcel Take)	Adverse Effect (Parcel Take)	No Effect	No Effect
11687 South State Street	No Adverse Effect	No Effect	No Effect	No Effect
11613 South State Street	No Adverse Effect	No Effect	No Effect	No Effect
11450 South State Street (aka 11440 South State Street)	No Effect	No Effect	No Effect	No Effect
11550 South 260 West	No Effect	No Effect	No Effect	No Effect
Jordan and Salt Lake City Canal Bridge at 200 West 11400 South	Adverse Effect (Parcel Take)	No Effect	Adverse Effect (Parcel Take)	Adverse Effect (Parcel Take)
Utah Lake Distributing Canal				
3300 West 12600 South	No Adverse Effect	No Adverse Effect	No Effect	No Effect
3100 West 11400 South	No Adverse Effect	No Effect	No Adverse Effect	No Adverse Effect
2700 West 10400 South	No Adverse Effect	No Adverse Effect	No Effect	No Effect
Utah and Salt Lake Canal				
2200 West 12600 South	No Adverse Effect	No Adverse Effect	No Effect	No Effect
2200 West 11400 South	No Adverse Effect	No Effect	No Adverse Effect	No Adverse Effect
1800 West 10400 South	No Adverse Effect	No Adverse Effect	No Effect	No Adverse Effect

**Table 4-25.
(cont.) Historic Property Impacts by Alternative**

Address or Other Location	Alternative 1	Alternative 3A	Alternative 4	Alternative 7
South Jordan Canal				
1500 West 12600 South	No Adverse Effect	No Adverse Effect	No Effect	No Effect
1500 West 11400 South	No Adverse Effect	No Effect	No Adverse Effect	No Adverse Effect
1100 West 10400 South	No Adverse Effect	No Adverse Effect	No Effect	No Adverse Effect
Beckstead Ditch				
1000 West 11400 South	No Adverse Effect	No Effect	No Adverse Effect	No Adverse Effect
Galena Canal				
1000 West 12300 South	No Adverse Effect	No Adverse Effect	No Effect	No Effect
900 West 11400 South	No Adverse Effect (New Crossing)	No Effect	No Adverse Effect (New Crossing)	No Adverse Effect (New Crossing)
Jordan and Salt Lake City Canal				
200 West 11400 South	No Adverse Effect	No Effect	No Adverse Effect	No Adverse Effect
11350 South at I-15	No Effect	No Effect	No Adverse Effect	No Effect
11500 South Lone Peak Parkway	No Effect	No Adverse Effect	No Effect	No Adverse Effect
12100 South Lone Peak Parkway	No Effect	No Adverse Effect	No Effect	No Adverse Effect
100 West 12300 South	No Adverse Effect	No Adverse Effect	No Effect	No Effect
Denver Rio Grande Western Railroad (UPRR)				
10850 South Jordan Gateway	No Effect	No Adverse Effect	No Effect	No Adverse Effect
380 West 11400 South	No Adverse Effect	No Effect	No Adverse Effect	No Adverse Effect
450 West 12300 South	No Adverse Effect	No Adverse Effect	No Effect	No Effect
No Effect	27	42	41	36
Adverse Effects	6	3	3	3
No Adverse Effects	26	14	15	20

* - This property has been identified by South Jordan City as an important cultural landmark for their community

** - This property has been identified by Riverton City as an important cultural landmark for their community

Note: Adverse Effect = Parcel Take; No Adverse Effect = Strip Take

If any cultural resources are encountered during construction, construction would immediately be stopped in the vicinity of the discovery, and any materials would be evaluated in accordance with UDOT Standard Specification 01355, Part 1.10.

Fair market value would be paid for ROW acquired and assistance will be provided for any necessary relocations, in accordance with The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended.

4.12 Hazardous Waste Site Impacts

This section discusses potential direct impacts from hazardous waste sites within the study area. There would be no significant indirect impacts associated with hazardous waste sites under any of the Build Alternatives.

No Build Alternative

Under the No Build Alternative, there would be no impacts to any of the identified CERCLIS, LUST or UST sites referred to in Section 3, Affected Environment.

Alternative 1

The Allstate Landscaping CERCLIS site, located at 492 West 12300 South in Draper, may be affected by Alternative 1. The site consisted of a trench possibly contaminated with pesticides and waste oil. However, since no hazardous materials were found, and the site has been closed with a No Further Remedial Action Planned (NFRAP) status, the likelihood of encountering contamination is low.

There are two open LUST sites in or near the corridor under this alternative:

- Texaco P.D.Q./Draper Texaco, 65 E. 12300 S.
- Lone Peak 66 #29057, 12292 S. Lone Peak Parkway

Two LUSTs are associated with the Texaco site, with one tank closed and one tank under remediation. All six USTs are listed as closed. Gasoline contamination is found in soil and groundwater. The likelihood of encountering contamination is considered moderate.

Four open USTs and two LUSTs are associated with the Lone Peak site. Because contamination levels are below the Tier 1 Screening Level, and since Utah Division of Environmental Response and Remediation (UDERR) has indicated that this LUST site will be recommended for closure in the near future, the likelihood of encountering contamination is considered moderate.

The following open UST sites were identified in the Alternative 1 corridor and may pose a concern during excavation. Because the majority of the sites are gas stations with USTs and the current conditions of these USTs are unknown, a moderate potential exists for encountering contamination during excavation activities.

10400 / 10600 South

- Sinclair #43032, 2680 W. 10400 S.
- Harmon's - South Jordan, 10400 S. Redwood Road

11000 South

- Costco Wholesale #487, 11000 S. Auto Mall Dr.

11400 South

- Albertson's Express #394, 11400 S. State St.

12300 / 12600 South

- Maverik #264 Riverton, 2707 W. 12600 S.
- 7-Eleven 1852-20137, 1754 W. 12600 S.
- Holiday Oil #33, 1327 W. 12600 S.
- Chevron, 231 W. 12300 S.

- Flying J – Draper, 87 E. 12300 S.

2700 West

- Maverik #333 / Old Circle K #8, 10419 S. 2700 W.

Redwood Road

- Phillips 66 #27938, 11366 S. Redwood Rd.
- Holiday Oil #32, 12573 S. Redwood Rd

1300 West

- Maverik #223 South Jordan, 10425 S. 1300 W.
- Rainbo #45, 12592 S. 1300 W.

Alternative 3A

The Allstate Landscaping CERCLIS site may be affected by Alternative 3A; however, because no hazardous materials were found at the site, and because the site has been closed with a NFRAP status, the likelihood of encountering contamination is low.

The UST and LUST sites are the same as under Alternative 1, except that Alternative 3A would not involve the two UST sites identified on 11400 South.

Alternative 4

No CERCLIS sites are located in the Alternative 4 corridor.

The following four open UST sites were identified in the Alternative 4 corridor and may pose a concern during excavation. All the sites are gas stations with USTs.

- Harmon's - South Jordan, 10400 S. Redwood Road
- Maverik #223 South Jordan, 10425 S. 1300 W.
- Albertson's Express #394, 11400 S. State St.
- Phillips 66 #27938, 11366 S. Redwood Road

Alternative 7

No CERCLIS sites are located in the Alternative 7 corridor. There is one open LUST site in the corridor under Alternative 7, the Lone Peak 66 #29057 site. Because contamination levels are below the Tier 1 Screening Level, and since UDERR has indicated that this LUST site will be recommended for closure in the near future, the likelihood of encountering contamination is low.

The following five open UST sites were identified in the Alternative 7 corridor, and may pose a concern during excavation. Four of the five sites are gas stations with USTs.

- Harmon's - South Jordan, 10400 S. Redwood Rd
- Maverik #223 South Jordan, 10425 S. 1300 W.
- Albertson's Express #394, 11400 S. State St
- Phillips 66 #27938, 11366 S. Redwood Rd.
- S.L.Co.Water/ Pump Station, 250 E. 11400 S.

4.12.1 Mitigation Measures

UDOT would coordinate with UDERR prior to acquisition of all or a portion of any of the properties discussed in this section. Through coordination, potential releases of hazardous material as a result of construction activities would be minimized.

4.13 Visual Impacts

No Build Alternative

Under the No Build alternative, visual qualities of the area would remain as they are at present or as modified by other projects and development. No major road construction projects would be completed. New development could still occur, but would be constrained by the existing road capacities.

Alternative 1, 4, and 7

Major visual impacts to the Jordan River floodplain area would occur in the 11400 South vicinity under Alternatives 1, 4, and 7. All three alternatives would involve constructing 11400 South to the west from where it now dead-ends on the bluffs above the Jordan River at approximately 720 West. The new 98-foot-wide roadway would travel down the steep slope on fill material, cross the Jordan River, tie in with the existing River Front Parkway (1060 West), then continue up the hill on a preserved ROW. The road would join the existing 11400 South at 1300 West. Substantial cut and fill walls would be required in this location. The height of these fill walls range from 2 to 25 ft, while the cut wall heights range from 4 to 24 feet.

Extensive efforts were made to inform affected homeowners between River Front Parkway and Midas Creek of what the proposed cut/fill walls would be like. Project team members met with the residents in this area on two separate occasions. During the first meeting, residents and team members walked along the preserved roadway corridor, with one project engineer holding a survey rod showing the approximate height of the cut walls (which included the height of the proposed noise walls) at each property. The second meeting was held very near the affected neighborhood at a meeting room in a nearby business office. At this meeting, the project team presented visual simulations of the

walls made from photographs taken of the neighborhood. The visual simulations were also presented at the public open houses and several were included in the DEIS and are also included in this FEIS. The estimated cut and fill wall heights at each property owner's location is shown in Figure 4-4.

The viewers affected by a new river crossing would be Parkway trail users, motorists on nearby streets, and residents of the 11400 South area. The new roadway and crossing of the Jordan River would add an additional major man-made element to the viewshed. Figures 4-5 and 4-6 show a simulation of the new 11400 South roadway and a simulation of a retaining/noise wall along this roadway. As discussed in Section 3.13, the quality of the scenery is presently somewhat diminished by residential development that has visually encroached into the river viewshed in some areas, on both the side hills and on the valley floor. These factors have already introduced discordant elements into the character of the landscape that results in only a moderate level of intactness of the overall visual resources of the Jordan River. The introduction of a new river crossing and road at 11400 South would further serve to diminish the quality of the scenery.

A pedestrian crossing would also occur for Alternatives 1, 4, and 7. The pedestrian crossing would tie the Jordan River Parkway trails on each side of the Jordan River together, affording users safe and easy routes to cross the river. Visual impacts of the pedestrian crossing would not be significantly greater than impacts of the roadway crossing (see Figure 4-7).

Figure 4-8 shows how the widened 10600 South roadway would look near 1300 West under Alternatives 1, 3A, and 7.

Alternative 3A

Minor visual impacts would occur under Alternative 3A. Alternative 3A includes widening of 10400/10600 South, 12300/12600 South,

and Jordan Gateway/Lone Peak Parkway. Both 10400/10600 South and 12300/12600 South have recently (or will in the immediate future) been improved with two travel lanes in each direction, a center turn lane, and shoulders and sidewalks. Implementation of Alternative 3A would result in additional widening of these roads, with the potential of 47 home and business relocations. Widening these existing arterial roadways would result in minor visual impacts to the existing landscape.

4.13.1 Mitigation Measures

Mitigation measures could somewhat lessen the visual intrusion. For example, the bridge and associated structures would be painted more natural colors to lessen the contrast of the man-made and the natural elements. Street lighting could be directed downward, to avoid unnecessary lighting of the night sky. Decorative elements would be added to the cut and fill walls and sound walls where required, such as patterned concrete. South Jordan and Draper cities could provide betterment funds for decorative lighting, decorative elements, or landscaping in order to soften the visual impact of the new roadway and bridge.

If one of the river crossing alternatives is selected in the ROD, additional geotechnical evaluation will be conducted during final roadway design to determine if taller cut walls could be constructed, thereby reducing the height of the required fill walls in the area between Marco Polo Drive and Chapel View Drive. Specifically, the evaluation will determine if construction of a taller cut wall (increasing the cut walls from a maximum of 25 feet to a maximum of 32 feet) is viable near Marco Polo Drive. If so, one additional relocation may be required (a residence on Annika Circle); however, this would reduce the required height of the fill walls in this area from a maximum of 12 feet, as currently proposed, to a maximum of 5 feet.

4.14 Energy

Roadway projects involve energy consumption during construction. The No Build alternative would require minimal construction energy. Periodic roadway maintenance within the study area such as resurfacing and patching would occur over time until the condition of the roadways warrants complete reconstruction.

Construction energy use would be similar for all Build alternatives, which would have similar roadway construction energy requirements. However, Alternatives 1, 4, and 7 would require additional energy to construct a bridge over the Jordan River and the extension of 11400 South. All alternatives depend on petroleum products for typical roadway construction activities, including maintenance of traffic, clearing, grading, construction of temporary haul roads, excavation of unusable soils and associated disposal, construction of drainage structures, base course and paving operations, utility relocations, and landscaping.

4.14.1 Mitigation Measures

Energy expenditures would be mitigated by the better operating conditions (including less congestion) of the improved roadways, and associated roadway network, after construction is completed.

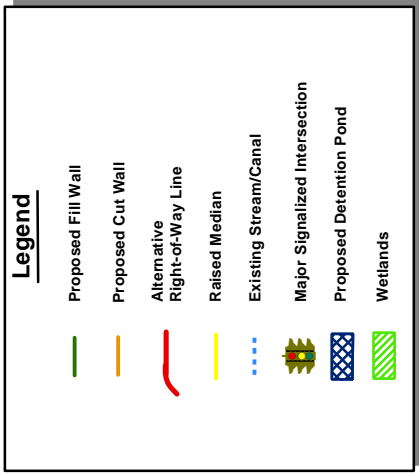
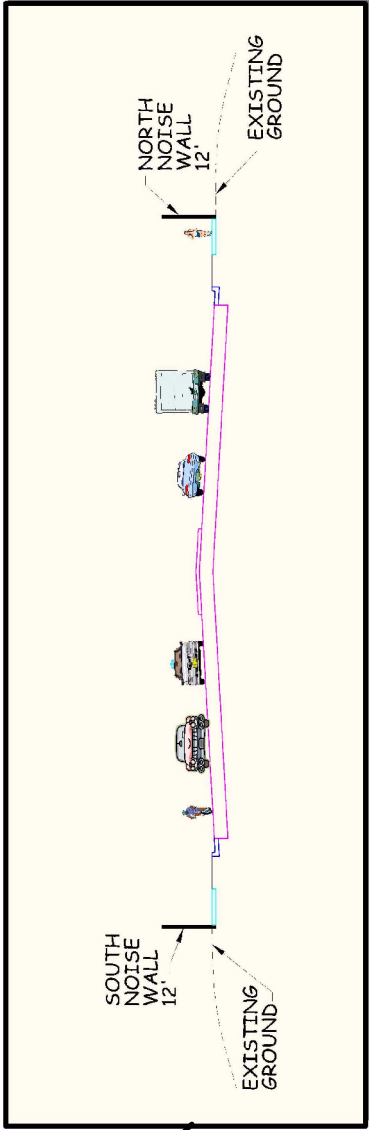
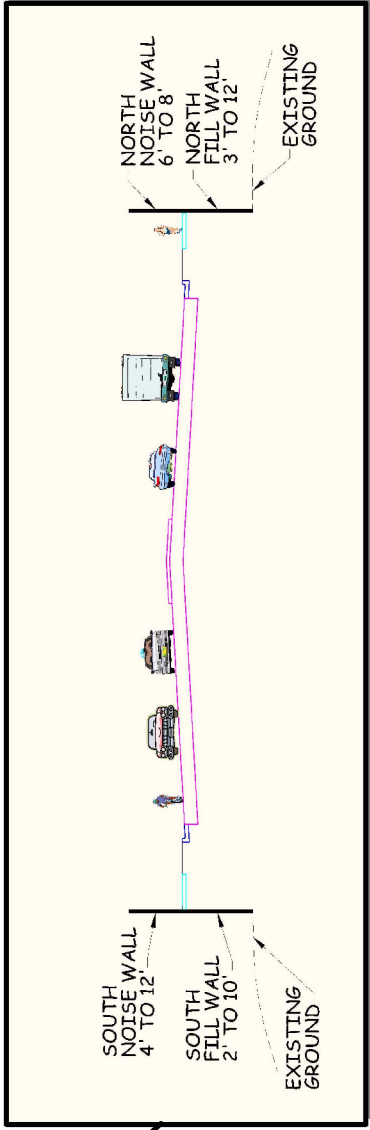
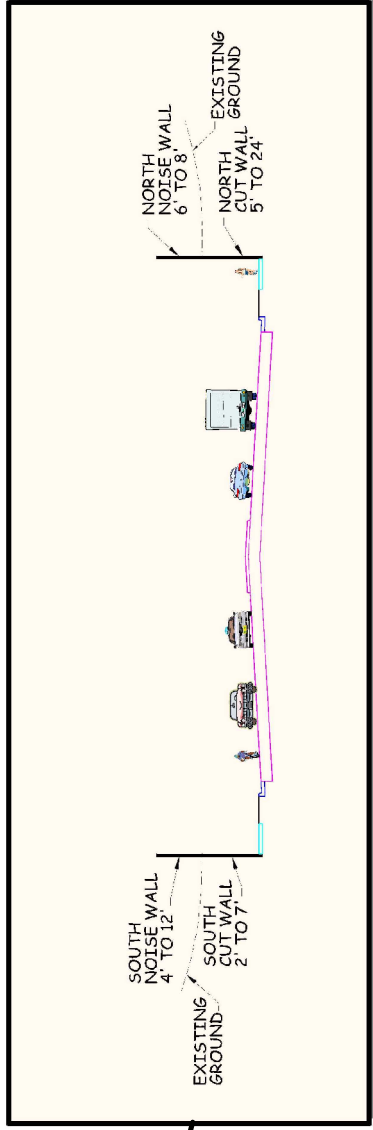
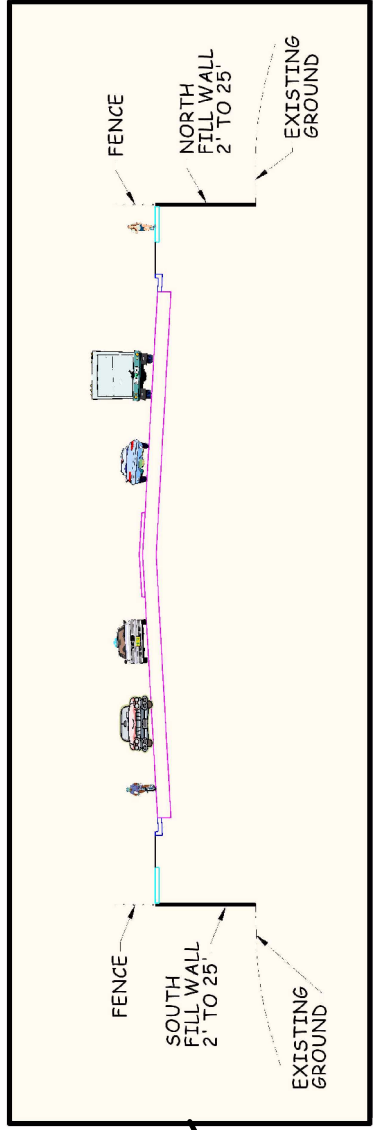
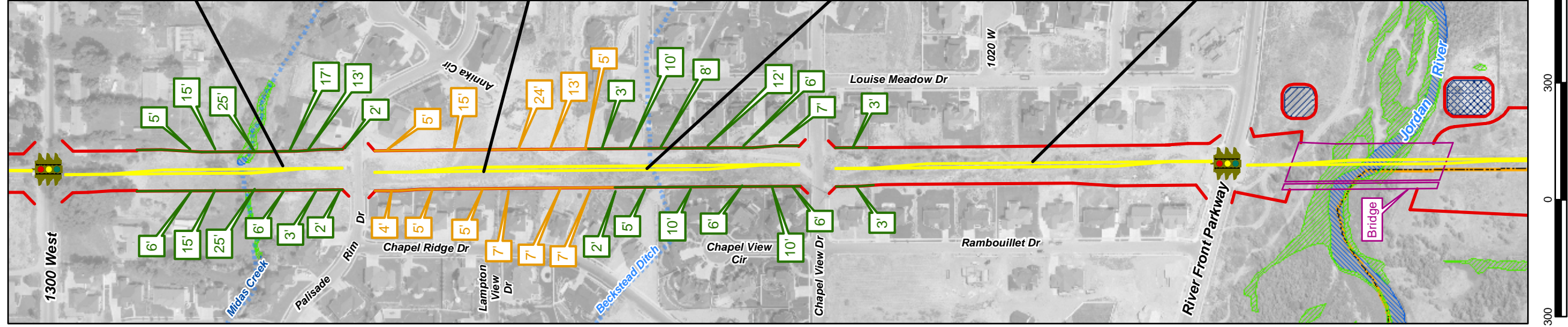


Figure 4-4.
Cut and Fill Wall Heights
11400 South: 1300 West to
River Front Parkway



Figure 4-5. Existing and Simulation of New 11400 South Roadway





Figure 4-6. Existing and Simulation looking at 11400 South Noise Wall





Figure 4-7. Existing and Simulation of Proposed Jordan River Crossing





Figure 4-8. Existing and Simulation of the 10600 South Roadway near 1300 West



4.15 Construction Impacts

No Build Alternative:

There would be no construction disruption to residents, businesses, or the environment under the No Build Alternative.

Alternatives 1, 3A, 4, and 7

Similar construction impacts would occur under each of the Build alternatives.

These impacts are typically of short duration and would consist of:

- Water quality impacts
- Traffic impacts to motorists, residents, businesses, pedestrians and bicyclists
- Air quality impacts
- Noise impacts
- Vegetation impacts
- Utility impacts

In addition, there is a potential for encountering hazardous materials or cultural resources during ground disturbing activities.

4.15.1 Water Quality

Construction in areas near surface water features, such as the Jordan River, presents the greatest potential for water quality impacts. Typical construction activities such as clearing, grading, filling, demolition, and excavation include the potential for erosion of surface soil due to the decrease in vegetative cover and an increase in exposed areas. Impacts to surface water during construction include potential increase in surface water flow and pollutant concentrations to receiving waters.

4.15.1.1 Mitigation Measures

Under any of the Build Alternatives, more than one acre would be disturbed during construction. Therefore, a UPDES storm water construction permit and Storm Water Pollution Prevention Plan (SWPPP) would be required. Best management practices specified in the SWPPP for the project would be used during construction to minimize impacts to surface water. Erosion control devices would be used to minimize erosion and sedimentation in areas of temporary as well as permanent land disturbance. Devices may include silt fences, retention basins, detention ponds, interceptor ditches, erosion mats, and mulching. Temporarily disturbed areas would be revegetated upon completion of construction. Equipment would be in good working and well maintained condition, and monitored during use to discover and repair any leaks.

4.15.2 Vehicle, Pedestrian, and Bicycle Traffic

Temporary impacts to traffic, pedestrians, and bicyclists could include construction delays, re-routing, and temporary lane closures.

Construction disruption to residents and businesses would occur at the following locations, under each of the alternatives. Since construction phasing is likely, construction impacts would not occur at these locations simultaneously, but would be phased. Phasing would allow construction impacts to be dispersed, instead of occurring all at once.

Alternative 1 would result in construction disruption along

- 10400/10600 South, Bangerter to I-15
- 12300/12600 South, Bangerter to I-15
- 11400 South, Bangerter to State Street
- 11000 South, Jordan Gateway to I-15

- 11800 South, Lone Peak Parkway to I-15
- I-15 Interchange at 10600 South
- State Street, 11400 South to 12300 South

Alternative 3A would result in construction disruption along:

- 10400/10600 South, Bangerter to I-15
- 12300/12600 South, Bangerter to State Street
- 11000 South, Jordan Gateway to I-15
- 11800 South, Lone Peak Parkway to I-15
- Jordan Gateway, 10600 South to 11400 South
- Lone Peak Parkway, 11400 South to 12300 South
- I-15 Interchange at 10600 South

Alternative 4 would result in construction disruption along:

- 10400/10600 South, Redwood to I-15
- 11400 South, Bangerter to State Street
- Jordan Gateway at 10600 South, 11400 South, and 12300 South
- I-15 Interchange at 10600 South

Alternative 7 would result in construction disruption along:

- 10400/10600 South, Redwood to I-15
- 11400 South, Bangerter to 300 East
- Jordan Gateway, 10600 South to 11400 South
- Lone Peak Parkway, 11400 South to 12300 South
- I-15 Interchange at 10600 South

4.15.2.1 Mitigation Measures

A traffic management plan would be developed and implemented during construction to assure access to residences, businesses,

community facilities and services, and local road. Construction signs indicating access points and signs indicating that businesses are still open would be used to reduce construction impacts to businesses along the corridor. Construction sequencing and activities would be coordinated with emergency service providers to minimize delays and response times during the construction period.

4.15.3 Air Quality

Air quality impacts could include fugitive dust (particulates) from soil exposed to wind and traffic, and emissions from construction vehicles. Construction vehicle emissions are not expected to increase ambient concentrations of carbon monoxide, hydrocarbons, and nitrogen oxides.

4.15.3.1 Mitigation Measures

A Dust Control Plan would be developed prior to construction. Techniques that may be included in the Dust Control Plan are minimizing track-out of soil onto nearby roads; reducing vehicle speed on unpaved surfaces; covering haul vehicles; and applying either chemical dust suppressant or water to exposed surfaces, particularly to surfaces on which construction vehicles travel.

4.15.4 Noise

Construction activities would result in short term increases in noise levels around the construction site.

4.15.4.1 Mitigation Measures

Construction noise would be minimized by adhering to UDOT's *Standard Specifications for Environmental Protection*. Construction noise would be minimized by the use of mufflers on construction equipment. Air compressors would meet federal noise level standards and would, if possible, be located away from or shielded from residences and other sensitive noise receptors.

4.15.5 Vegetation

Roadway construction activities would result in temporary and permanent impacts to vegetation. Some vegetation would be removed during cut and fill and other construction activities.

4.15.5.1 Mitigation Measures

All areas temporarily disturbed would be re-vegetated at the end of construction. Land owners would be compensated for disturbed landscaping. Provisions of UDOT Construction Specification 01575, Invasive Weed Control, would be followed in order to prevent the introduction of invasive weed species into or out of the job site. Provisions include cleaning equipment before entering the project area, avoiding unnecessary disturbance of areas known to be infested with noxious weeds, and the use of herbicides where appropriate to control weeds.

4.15.6 Utilities

There may be temporary disruption of utility service during construction activities. Under all the Build Alternatives, there may be temporary access impacts to the railroad.

Widening 11400 South, included in Alternatives 1, 4, and 7, may impact a high-pressure 33-inch water line that runs along the south side of 11400 South, one or both of the sewer lines that run along the Jordan River and cross 11400 South, the 46 kiloVolt power transmission line that runs along 11400 South, and the Bingham substation located on the northwest corner of 2700 West and 11400 South (each of these utilities are discussed in Section 3.14).

To construct any grade separated crossing for the railroad, a temporary shoofly (railroad bypass) would be constructed. The shoofly would be required for the railroad crossings on 11400 South (Alternatives 1, 4, and 7), for the Jordan Gateway crossing

(Alternatives 3A and 7), and for the 12300 South crossing (Alternatives 1 and 3A).

The purpose of the shoofly is to allow rail traffic to pass around the railroad bridge construction and the new railroad fill areas. The shoofly would be constructed at approximately the same elevation as the existing track and would be located adjacent to the existing line at a distance from the existing track sufficient to allow construction of the proposed rail line embankment and bridge without interrupting rail service. It is anticipated that the shoofly would be located adjacent to the existing tracks where there is sufficient distance north and south to tie the shoofly back into the existing track. The shoofly extents are shown in Figure 4-9.

4.15.6.1 Mitigation Measures

Temporary construction easements from adjacent property owners may be necessary to allow construction and use of the shoofly under any Build Alternative. The shoofly would use the same level of railroad crossing warnings (i.e. flashing lights only or flashing lights with crossing arms) as is currently being used at each location at the time of construction. The impacts would be temporary, but long-term (a year or longer). Once construction of the proposed railroad bridge and rail line are completed, the rail traffic would be shifted to the new line, the shoofly would be removed, and the impacted properties would be restored to their original condition.

The high-pressure water line along the south side of 11400 South is under approximately 5 feet of cover and is currently trenched under the Jordan River. To mitigate possible impacts to this water line if 11400 South is widened, it may need to be relocated.

Two 48-inch sewer lines run along the ridgelines on either side of the Jordan River and have approximately 7 feet of cover. To mitigate impacts to these sewer lines if 11400 South is widened, one or both sewer lines may need to be relocated.

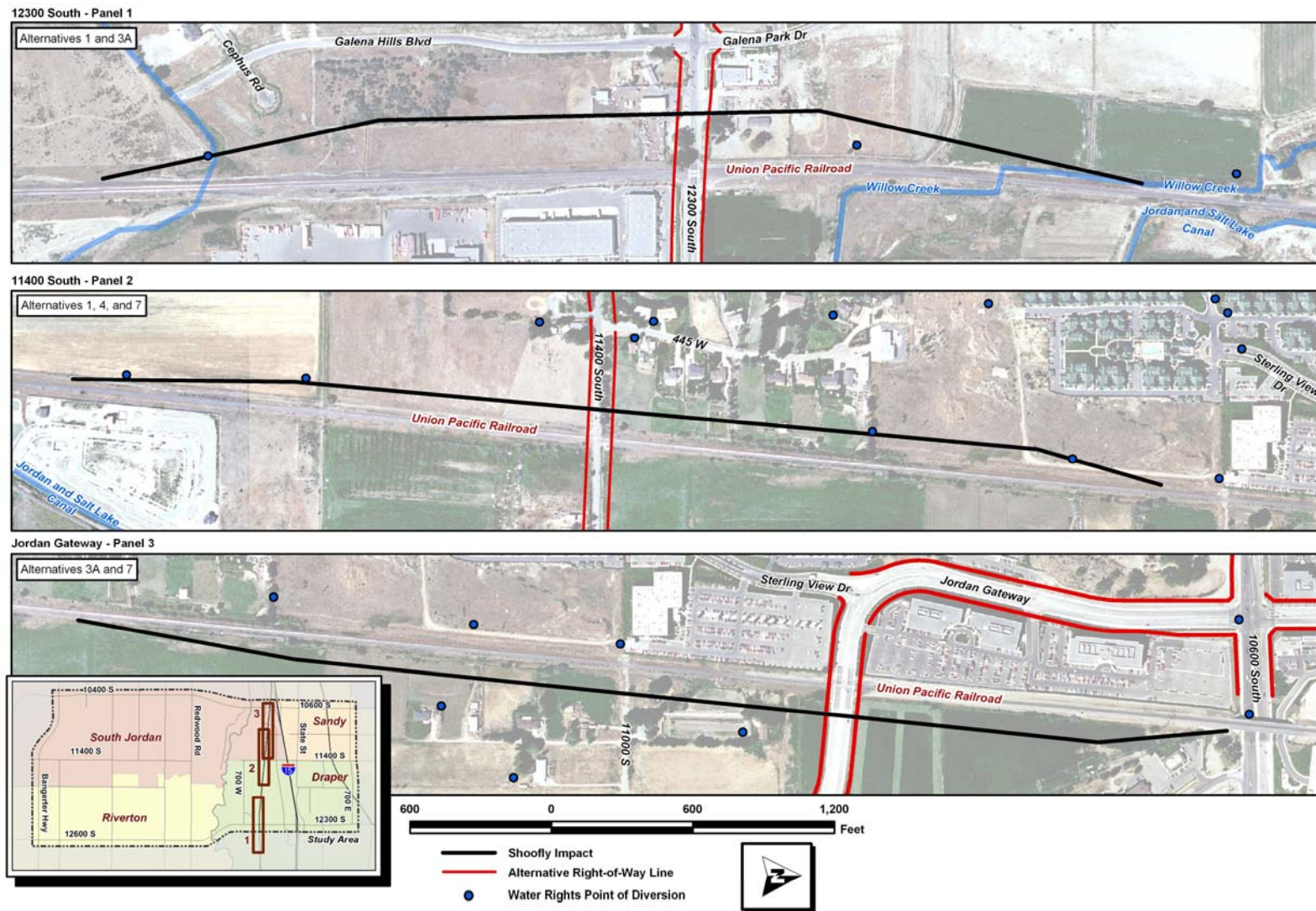


Figure 4-9. Shoofly Extent Impacts

A 46-kilovolt transmission line runs along 11400 South and the Bingham substation is located on the northwest corner of 2700 West and 11400 South. To mitigate impacts to these facilities if 11400 South is widened, they may need to be relocated.

4.15.7 Hazardous Materials

The possibility of encountering soil contamination exists at all UST and LUST sites within the project area.

4.15.7.1 Mitigation Measures

If petroleum contamination were encountered during construction, mitigation would be coordinated in accordance with the UDOT Standard Specification *Environmental Protection*, which directs the contractor to stop work and notify the project engineer of the possible contamination. Disposition of any hazardous material would take place according to Utah Department of Environmental Quality guidelines.

4.15.8 Cultural Resources

There is a potential for encountering unknown cultural resources during construction activities.

4.15.8.1 Mitigation Measures

If any cultural resources were encountered during construction, construction would be stopped and any materials would be evaluated in accordance with UDOT Standard Specification 01355, Part 1.9.

4.16 Permits

In accordance with FHWA guidance, this section lists permits that would be required if one of the Build Alternatives is selected.

Stream Alteration Permit

If alterations are to be made to the Jordan River bed or bank, or for alterations of any other streams, a Stream Alteration Permit is required from the Utah Department of Natural Resources, Division of Water Rights, which would also be subject to approval by the U.S. Army COE.

Flood Control Permit

The Jordan River, Midas Creek, Butterfield Creek, East Jordan Canal, Jordan and Salt Lake Canal, South Jordan Canal, Utah and Salt Lake Canal, and the Utah Lake Distributing Canal are all Countywide Flood Control Facilities. Construction of bridges, culverts, channel improvements, etc., would be considered modifications to the facilities and would require a Flood Control Permit from Salt Lake County. In addition, the canal companies may require separate agreements or permits for work done on their canals.

FEMA Permit

All of the bridge configuration options investigated as part of the Hydraulics Study resulted in less than one foot of increase to the 100-year floodplain water surface elevation, which can be characterized as a minor impact. Regardless, FEMA coordination and permitting will be required since the bridge options encroach into the Jordan River's regulatory floodway. All bridge options had bridge piers and abutments located within FEMA's regulatory floodway. Structure crossings will be sized to meet UDOT drainage criteria, FEMA requirements outlined in 44 CFR, and any additional requirements outlined in 23 CFR 650. A one-foot maximum rise in water surface elevation for the 1% chance flood is allowed by all of these requirements, however prudent design may dictate a lesser rise. In cases where these requirements

cannot be met, a formalized Conditional Letter of Map Revision and Letter of Map Revision would be required by FEMA.

Clean Water Act Section 404 Permit

Either an individual or nationwide permit is required for activities involving the discharge of dredge or fill material into “Waters of the United States” including wetlands. The permit program is jointly administered by the ACOE and the EPA. In Utah, the permit program is a cooperative effort between the State Division of Water Rights and the ACOE.

Easement for Crossing Jordan River

The bed of the Jordan River is considered State sovereign land, and is managed by the State DFFSL in the Department of Natural Resources. An easement must be obtained from the DFFSL for any river crossings or stream alterations.

UPDES Storm Water General Permit for Construction Activities

This permit would be required if a construction project disturbs 1 acre or more of land. The permit is obtained by preparing a Storm Water Pollution Prevention Plan and Notice of Intent for the State Department of Environmental Quality, Division of Water Quality.

4.17 Relationship Between Local Short-term Uses of Man’s Environment and the Maintenance and Enhancement of Long-term Productivity

The 11400 South FEIS is based on comprehensive transportation planning that considered the need for future mobility within the context of present and future land use development zoning regulations. The local short-term impacts and use of resources by the proposed action are consistent with the maintenance and enhancement of long-term productivity. All roadway projects

require the investment or commitment of some resources found in the existing environment. Short-term refers to the immediate consequences of the project; long-term relates to its direct or secondary effects on future generations.

Short-term consequences of the No Build alternative include traffic congestion around major intersections and along major roadways, since no new construction would take place in the project area.

The short-term consequences of all four Build alternatives include:

- Relocation of residents and businesses (see Section 4.3.2)
- Removal of several private properties from tax rolls, thereby reducing the property tax base
- Conversion of existing land use to transportation use
- Inconvenience to residents, business owners, suppliers, and employees during construction.
- Some stream turbidity increases during construction
- Vegetation loss due to construction clearing

Several long-term productivity enhancements may be realized from the proposed Build alternatives, including:

- An efficient transportation network in a rapidly developing area that would provide better access for daily commuting and local trips
- Increased motorist convenience
- Reduced energy usage due to less delay time
- Potential for new tax base in the project area by providing transportation infrastructure to accommodate local economic development
- Enhanced employment growth for the region.

4.18 Irreversible and Irretrievable Commitments of Resources Which Would be Involved in the Proposed Action

Implementation of any of the Build alternatives would involve a commitment of a range of natural, physical, human, and fiscal resources. Considerable amounts of fossil fuels, labor, and construction materials such as cement, aggregate and bituminous material would be expended in the construction of Alternatives 1, 3A, 4, or 7. Additionally, large amounts of labor and natural resources would be used in the fabrication and preparation of construction materials. These materials are generally not retrievable or reusable. However, they are not in short supply and their use would not have an adverse effect on continued availability of these resources.

Any roadway construction would also require a substantial expenditure of local, state, and federal funds which are not retrievable and which, in theory, could be used by other projects. The benefits resulting from the improved transportation system are believed to outweigh the potential impact from the commitment of the resources.

4.19 Cumulative Impacts

This section discusses cumulative impacts that have occurred and may occur as a result of the No Build and Build Alternatives. The Council on Environmental Quality (CEQ) has defined a cumulative impact as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time” (40 CFR 1508.7).

The geographic area addressed in this cumulative impacts analysis is generally defined as the study area boundaries, but considers nearby projects that would contribute to impacts within the study area. The time interval for this analysis is from the mid-1960s, when I-15 was constructed to the design year 2030. The construction of I-15 facilitated the rapid residential and commercial development in the South Valley.

All resources were analyzed to determine which would be affected by cumulative impacts. Resources that may be impacted by cumulative impacts include land use, wetlands, wildlife habitat, water quality, and cultural resources. These resources were analyzed to determine if cumulative impacts would occur. In accordance with CEQ guidance, this analysis assesses the future cumulative impacts for activities that can be reasonably forecast.

The following reasonably foreseeable future activities could result in cumulative impacts:

- Projects listed in the WFRC 2030 Long Range Plan;
- Land Use plans of Draper, Riverton, Sandy, and South Jordan Cities;
- Developments that have concept plans or plats approved or pending in Draper, Riverton, Sandy, and South Jordan Cities; and
- Salt Lake County Parks and Recreation Department's plans for recreational areas in the corridor.

4.19.1 Past, Present, and Reasonably Foreseeable Future Projects

Figure 4-10 shows the reasonably foreseeable projects, along with the existing commercial and residential development and roadway projects within the project study area. Also shown on Figure 4-10 are the current environmental resources within the study area, including wetlands, wildlife habitat, recreational areas, water resources, cultural resources, and floodplains.

Past Projects

- Major residential and commercial development projects in the project area cities have contributed to making the southern Salt Lake Valley one of the fastest growing regions in the state. Most of the past agricultural areas in Draper and Sandy east of I-15 have been developed into residential and commercial uses. Rapid business and population growth has contributed to current traffic volumes within the study area.
- The construction of I-15 formed a physical barrier that limits east-west crossing locations. This focusing of all east-west crossing traffic and I-15 interchange traffic to a few shared locations creates congestion bottlenecks.
- In 2002, 10600 South was widened to four travel lanes with a center turn lane or median between I-15 and Redwood Road.
- Redwood Road was widened to four lanes with a center turn lane or median from 10600 South to 9000 South. construction was completed in 2004.
- The I-15 flyover from State Street onto I-15 was removed in 2003 and Factory Outlet Drive/State Street was realigned and widened to four lanes from 12300 South to 11800 South. This flyover provided southbound access onto I-15 from State Street and northbound access from I-15 onto State Street.
- The 12300/12600 South corridor from 700 East to Bangerter Highway, including a new interchange design at 12300 South and I-15, was recently constructed. This project widened SR-71 to five lanes along this segment.
- I-15 was recently widened to ten lanes from 10600 South to the Salt Lake County/Utah County line.

Present Projects

- The intersection of State Street and 11400 South is being reconstructed and State Street will be reconstructed between 11200 South and 11800 South to be a consistent five-lane section. This is scheduled to occur in 2005.
- An EA was recently completed and a FONSI was signed by FHWA to widen 700 East between 12300 South and 9400 South to four lanes with a center turn lane or median. Design is currently underway with construction scheduled to begin in 2006.
- An EA was recently completed and a FONSI signed by FHWA to widen 10400 South between Redwood Road and Bangerter Highway to four lanes with a center turn lane or median. Design is currently underway with construction scheduled to begin at the end of 2006.
- An Environmental Study (ES) is being completed to widen Redwood Road from 10600 South to Bangerter Highway to four travel lanes with a center turn lane or median. Construction is planned for 2007.
- The Daybreak Master Planned Community, a 4,100 acre mixed-use development, has begun construction in South Jordan west of Bangerter Highway between 11400 South and 10400 South. Daybreak is planned to include 13,000 homes, 1,500 acres of parks and open space, several schools and town villages and a TRAX light rail stop when build out is completed over the next two decades
- Several residential housing developments are underway in South Jordan along 11400 South.
- A new South Jordan community cultural center is planned north of 10600 South at Jordan Gateway;

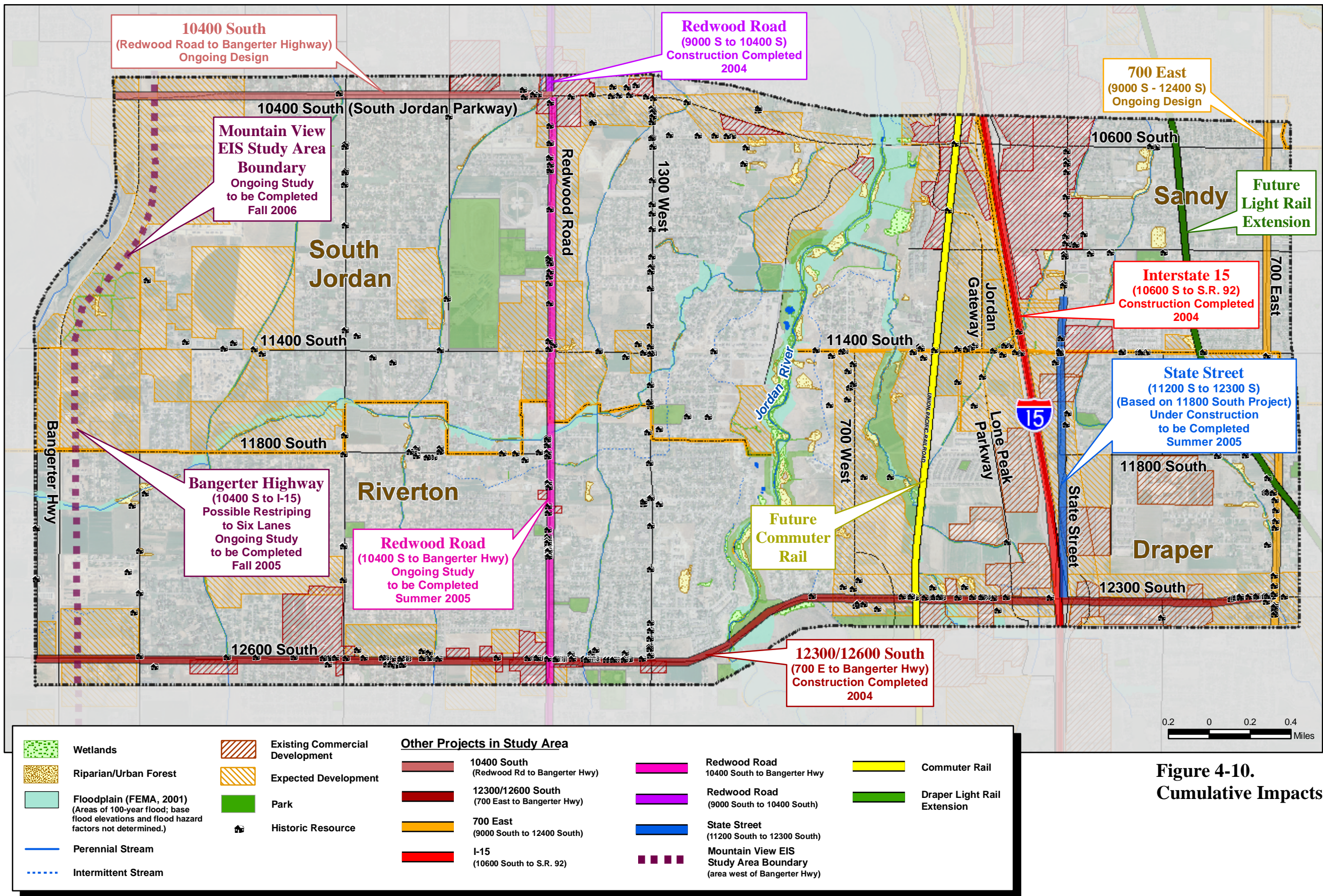


Figure 4-10.
Cumulative Impacts

- A Wal-Mart is planned for development at the northwest corner of Jordan Gateway and 11400 South. Construction is expected to begin in Spring 2005. The company that is developing the Wal-Mart has indicated that if an I-15 interchange at 11400 South is built, a Sam's Club will also be developed at the same location.
- A 100+ acre mixed-use development with residential units is planned at 11400 South and Bangerter Highway. Development is expected to start in early 2005.
- A new strip mall is currently being planned for the southeast corner of River Front Parkway and 10600 South.
- A 20-acre mixed used development is planned for the southwest corner of Jordan Gateway and 10600 South. Construction is expected to begin within six to twelve months.
- The Sterling Village residential development on Jordan Gateway is expected to construct an additional 600 residential units beginning in the spring of 2005.
- Draper City has plans to realign 11800 South so that it intersects with 700 East at 11800 South rather than skewing and intersecting with 700 East at about 11900 South. The new 11800 South intersection would be signalized.
- Regional commercial development at 12300 South on the north side of the road, west of 300 East is currently underway and nearing completion.

Reasonably Foreseeable Future Projects

- Future St. Mark's Hospital, approximately 150 beds plus a brain trauma center and professional office space, on the southeast corner of 11800 South State Street.

- Medium- to high-density residential development of 200 to 300 units south of 11400 South along 700 East, to include commercial development along 700 East.
- Retail development at northwest corner of 12600 South and Bangerter Highway;
- Big box retail development at the northwest corner of 3600 West and 12600 South;
- Retail development at the northwest and southwest corners of Redwood Road and 12600 South;
- Intermountain Health Care (IHC), a large health services corporation, on the southwest corner of 12600 South and Bangerter Highway; and
- Industrial/office space immediately south of 12600 South on Bangerter Highway.
- An EIS is being conducted to identify transportation alternatives and assess environmental impacts for the Mountain View Corridor (MVC). The MVC EIS area is approximately 35 miles long. The north-south parameters extend from I-80 in Salt Lake County to the Pleasant Grove Interchange in Utah County to the south (approximately 6400 North). The east-west parameters extend from Bangerter Highway (east) to U-111 (approximately 6900 West) in Salt Lake County; and approximately 11800 West in Saratoga Springs to I-15 for the Utah County portion.
- Future Draper Light rail extension through the study area (LRP Phase 2).
- Construct commuter rail from Utah County to Weber County (LRP Phase 1).
- UDOT has proposed re-striping Bangerter Highway to accommodate six travel lanes between 10400 South and I-15. This is currently being studied.

4.19.2 Cumulative Impacts to Land Use

Transportation infrastructure development and land development are interrelated. While transportation modes, such as roadways, buses, and rails provide residents access and mobility, an area's demand for economic growth and development also creates a demand for transportation improvements.

The study area is an area of Salt Lake County that is experiencing high growth and development rates. As businesses and residents move into the area, the existing transportation infrastructure breaks down and demand for improvements increases. Likewise, as the transportation infrastructure is improved, land development increases, taking advantage of newly accessible areas.

For all Build Alternatives, along with the other past, present, and reasonably foreseeable future projects, major transportation improvements may influence the location, density, and type of development that would occur in the study area. However, land use and development patterns are established primarily by local and regional long range planning and zoning efforts.

As shown in Figure 4-10, the majority of undeveloped and agricultural land within the project study area is planned for residential and commercial development by the study area cities, with the exception of land within the Jordan River floodplain and land reserved for recreational facilities. Much of this development is currently underway.

4.19.3 Cumulative Impacts to Wetlands

Based on the National Wetlands Inventory, the wetlands overview, and the wetlands delineation conducted for this FEIS, approximately 59 acres of wetlands, both jurisdictional and non-jurisdictional, currently exist within the project study area. The majority of the jurisdictional wetlands occur along the Jordan

River, primarily within the 100-year floodplain. As shown in Figure 4-10, no significant development is planned within the Jordan River floodplain. However, existing development within the floodplain and along Willow Creek and Midas Creek most likely impacted wetlands that existed in the past.

Based on the wetlands overview, approximately 4 acres of the existing 59 acres of wetlands within the study area may be impacted by planned commercial and roadway development. The majority of the impacted wetlands occurs along irrigation canals and roadside ditches and would be considered non-jurisdictional. The contribution to cumulative wetlands impacts from any of the Build Alternatives would be less than 0.6 acres of total wetlands and less than 0.3 acres of jurisdictional wetlands.

Development and other activities have contributed to the cumulative loss of environmental resources within the greater project area. Some of these other projects have or may contribute to the cumulative loss of wetlands and other waters, and will likely have direct and/or indirect negative impacts to these resources. The impacts to wetlands as a result of any alternative studied in this FEIS are small and easily mitigated. Thus, this project would not contribute significantly to the cumulative loss of wetlands.

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4.19.4 Cumulative Impacts to Wildlife Habitat

Currently 177 acres of wildlife habitat (59 acres of wetland habitat and 118 acres of riparian/urban forest habitat) has been identified within the project study area. Most of this habitat occurs along the Jordan River, with additional urban forest habitat and wetlands scattered throughout the project area. Within the project area, the majority of the native landscape has been altered to a great extent and is fragmented by roads and canals. Many areas have been developed or are planned for future development. As den and nesting habitat for wildlife species continues to diminish, biodiversity and abundance of wildlife species is also expected to diminish.

Undeveloped areas largely consist of agricultural lands and the Jordan River corridor. The planned development identified in Figure 4-10 is expected to impact approximately 22 acres of wildlife habitat (4 acres of wetland habitat and 18 acres of riparian/urban forest habitat). None of the Build Alternatives would impact more than 3.6 acres of additional wildlife habitat.

The Jordan River and its tributaries support riparian and wetland plant communities that offer suitable habitat for wildlife. Although the width of riparian zones is often restricted through the valley due to development of adjacent upland areas, certain reaches can provide abundant food, cover, water, and other special habitat requirements. Wildlife species use the riparian zone more than any other habitat type. Most important wildlife habitat resources remaining along Wasatch Front are within the riparian areas from Utah Lake to the Great Salt Lake along the Jordan River and its tributaries (NAS 2000). The Jordan River from Utah Lake to about 12300 South, south of the study area, has been the least affected by encroachment and channelization.

The Jordan River corridor has been altered by invasion of non-native species such as Russian olive (*Elaeagnus angustifolia*) and saltcedar (*Tamarix ramosissima*) and degraded water quality. While Russian olive and saltcedar are utilized by some wildlife, generally these species do not support the diversity and abundance of wildlife species that native riparian vegetation does (NAS 2000). Native wildlife has become limited to the Jordan River corridor as various forms of development have created barriers to wildlife movement on the east and west sides of the river. Mule deer, for example, are limited to the riparian corridor and are not able to seasonally migrate (Sakaguchi 2003). In addition, many species have been locally extirpated from the area, or occur only in small numbers. Generally, wildlife abundance and diversity has decreased due to the conversion of natural habitat to urban or suburban areas.

The continued development in the project area that is expected under the No Build Alternative will further restrict wildlife mainly to the Jordan River corridor, where relatively undisturbed, natural habitat would exist. Existing bridges and roads over the Jordan River fragment habitat for birds and mammals. Fragmentation can result in smaller, more isolated patches of habitat, providing less cover for prey species, increasing the risk of predation. Additionally, increased residential development that is encroaching closer to the banks of the river introduce non-native plant and animals species that are more tolerant of human development (NAS 2000). Many species less tolerant of human development and disturbance, such as traffic noise, may avoid the area, resulting in a local loss of biodiversity.

Other indirect impacts from development include predation by cats, dogs, and other urban associated wildlife, as well as resource competition with non-native species tolerant and adapted to urban development such as European starlings (*Sturnus*

vulgaris), house sparrows (*Passer domesticus*), and rock doves (*Columba livia*).

Implementation of any alternative studied in this FEIS would have low impacts on wildlife in the project area from habitat loss and disturbance. The initial settlement in the Salt Lake Valley and development of agricultural and urban areas has extirpated or displaced the majority of naturally occurring wildlife in the region (NAS 2000). Bird biodiversity and density has declined due to the replacement of native willows with Russian olive and saltcedar along the Jordan River corridor. While biodiversity in the Salt Lake Valley is low, several mitigation projects aimed at restoring habitat along the Jordan River would provide long-term improvements for native species inhabiting the Jordan River corridor (NAS 2000).

Alternatives 1, 4, and 7, which include a continuation of 11400 South and new bridge structures over the Jordan River, would contribute minor impacts to the degradation of wildlife habitat in the project area and potential loss of biodiversity through fragmentation and disturbance. Therefore, when considered with other development projects proposed or occurring in the project area, Alternatives 1, 4, and 7 would cumulatively contribute minor adverse affects to wildlife inhabiting the Jordan River corridor. Suggested riparian and wetland mitigation or enhancements would benefit wildlife inhabiting the area and minimize cumulative effects. Alternative 3A, which does not propose continuation of 11400 South, would have negligible cumulative effects on wildlife.

4.19.5 Cumulative Impacts to Water Quality

Cumulative impacts to water quality from existing and expected development would result primarily from increased storm water runoff due to increased paved areas for roadway and commercial development. Areas of residential development are not expected to have as significant of an impact on storm water runoff.

The assessment of water quality impacts from any of the Build Alternatives included storm water flows that would result from the roadway widening projects 12300/12600 South, State Street, and 10400 South, the addition of median lanes along I-15, and the proposed discharge (via a 54-inch storm drain) of Sandy's storm water into Willow Creek. These projects are proposed to be completed before any of the alternatives being proposed here would be constructed. Therefore, the impacts from these projects were already included in the water quality analysis.

Acres of additional paved surface due to commercial development were estimated from Figure 4-10. Within the study area, approximately 800 acres of new impervious surface may result from this planned development. The study area cities typically require developers to provide storm water detention to control runoff to 0.2 cfs per acre. Based on this requirement, runoff during a storm event may increase by 1,000 cfs within the study area. Typically, much of this runoff would infiltrate the ground or be further detained in city- and UDOT-owned detention facilities prior to entering surface water bodies.

It is expected that the additional runoff would elevate metals concentrations within the study area receiving streams, possibly above state water quality standards, particularly in smaller streams such as Midas Creek and Willow Creek. These elevated concentrations would be expected to occur only during the runoff events. The detention basins would result in settling of suspended matter, helping to lower the metals concentrations in the runoff.

Additionally, in designing the new ponds and existing pond expansions as part of this FEIS (along Midas Creek, adjacent to Jordan River at 11400 S. and east of Willow Creek at 11400 S.) extensive coordination with the surrounding cities took place to establish the existing and proposed roadway and development projects that would also need to utilize the ponds to ensure their

proper design. One of the major contributions from off site comes from Sandy. In it's 1998 Storm Water Master Plan, Sandy has proposed to install a 54-inch stormwater drainage line within 11400 South that would ultimately discharge storm drainage into Willow Creek from the east. The Sandy discharge will be routed through a detention basin that will be designed as part of this project to accommodate the Sandy flow as well as flow from this project. In the absence of this project, a detention basin would still need to be constructed to accommodate the Sandy City flow.

With the exception of several small segments, all of the roadway runoff from any of the Build Alternatives will be routed through existing or proposed detention basins. These detention basins are designed to handle both the existing and proposed project roadway drainage and surrounding development. As described earlier in this section, where necessary, the size of these ponds to accommodate the additional flow resulting from this project may be increased. Because detention basins are designed for a set discharge and detention time (which is dictated by the State and determines the amount of pollutant removal) additional flow will impact the size of the pond, but will not significantly impact the quality of the water discharged from the pond. Therefore, the contribution to cumulative water quality impacts due to this project would be minor.

4.19.6 Cumulative Impacts to Floodplains

Over the last 100 years, the Jordan River has undergone significant changes. River straightening and channelization, stream flow diversions, bridge construction, and floodplain development have considerably altered the natural equilibrium of the river. Concerns with development along the river were detailed in the Jordan River Natural Conservation Corridor Report (NAS 2000). According to this report, bridges crossing the river restrict the pre-settlement meander pattern. Since bridges are sized for

the 100-year flood and not the meander pattern, the channel is fixed at the bridge locations, and the river can only (potentially) meander in the stretches between the bridges, which get shorter as more bridges are constructed. Less meandering increases the flow gradient, leading to downcutting and entrenching of the streambed, which in turn causes the water table to drain and drop. This has two main results: the floodplain may dry out, impacting wetland vegetation and the wildlife that rely on wetlands; and erosion and sediment loads may increase from riverbanks into the river.

The Salt Lake County Jordan River Flood Channel Management Ordinance was developed in 1994, setting limits on the type of development and land uses within the designated corridor. The ordinance was developed to provide for the protection and use of the Jordan River channel for storm drainage and flood control and to promote greater channel stability within the flood channel corridor. Any construction or development proposed within the Jordan River Meander Corridor must undergo additional investigations, to assure that the use of the Jordan River flood channel is maintained.

Although encroachments associated with widening 10600 South and 12600 South would be negligible and would have a negligible impact on upstream flooding elevations (see Section 4.8.3), they would still contribute to the cumulative impacts on the floodplain. Encroachments associated with the new river crossing at 11400 South would result in up to approximately 0.5 foot increased flooding elevations upstream of the proposed bridge which can be characterized as a minor impact (Section 4.8.3). The extent of encroachment would be dependent on the final roadway configuration and design. To minimize impacts to floodplains, during final design the project design team will evaluate options that meet project design requirements and reduce the project's impact on floodplains.

4.19.7 Cumulative Impacts to Historical and Archaeological Resources

Previous roadway improvements, development, and other activities have contributed to the cumulative loss of historical, and to a lesser extent, archaeological resources within the greater project area. Some of these other projects have or may contribute to the cumulative loss of historical and archaeological resources, and will likely have direct and/or indirect negative impacts to these resources. Figure 4-10 shows the identified cultural resources within the study area. As indicated, many of these resources may be adversely affected by planned growth and development.

Although the negative impacts from any of the Build Alternatives would be additive to these impacts, all of the impacts from this project will be mitigated (after an attempt has been made to avoid and minimize). Formal detailed analysis and discussion of

avoidance, minimization, and mitigation has been developed as part of the Section 106 process in coordination with the SHPO and other appropriate agencies.

However, even with mitigation, some historic properties will be taken, thus, this project would contribute to the cumulative loss of historic resources. In that no significant archaeological resources will be affected by any of the proposed alternatives, this project would not contribute to the cumulative loss of archaeological resources.

4.20 Impact Summary Table

Table 4-26 provides a summary of impacts analyzed in identifying the Preferred Alternative.

**Table 4-26.
Impact Summary Table***

Alternative	No Build	Alt 1	Alt 3A	Alt 4	Alt 7
Mobility Improvements (Year 2030 p.m. peak conditions, 5 to 6 p.m.)					
Critical Intersections at or over capacity (#)	7	4	5	4	5
I-15 Ramps/Segments at or over capacity	1	5	5	0	5
Interchange areas at or over capacity	2	0	0	0	0
Travel time reduction over No Build (overall study area)	N/A	28.6%	28.2%	30.7%	21.4%
Travel time reduction over No Build (to the Interstate)	N/A	9.5%	16.7%	22.2%	5.6%
Economic Development Benefits					
Estimated additional retail sq ft over No Build	N/A	856,000	0	1,388,000	825,000
Estimated additional sales tax revenue over No Build	N/A	\$2,996,000	\$0	\$4,683,000	\$2,887,500
Right-of-Way Acquisitions and Relocations					
Home Relocations (#)	0	60	34	26	31
Business Relocations (#)	0	16	16	0	2
Wetlands					
Wetlands Impacts - Jurisdictional acres (Total acres)	0	0.28 (0.68)	0.01 (0.37)	0.26 (0.57)	0.26 (0.64)
Noise Impacts					
Receptor dwellings at or over the Noise Abatement Criteria**	148	258	181	255	253
Receptor dwellings that could achieve 5dBA or greater mitigation	0	72	27	29	39
Section 4(f) Property Impacts					
Section 4(f) Historic Resource Impacts – Parcel Take (#)	0	6	3	3	3
Section 4(f) Historic Resource Impacts – Strip Take (#)	0	26	14	15	20
Section 4(f) Recreation/Wildlife Resource Impacts (#)	0	5	4	2	2
Construction Costs					
Preliminary Cost Estimate (million \$)	0	208	167	122	150

* Highlighted boxes indicate best build option for criteria

** Includes substantial noise increases of 10 dBA or more